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This guide for teachers, students, and adults illustrates how it is possible to use Ward's Island as an outdoor laboratory. It contains a guide to 30 kinds of trees on the island, along with clearly drawn maps and illustrations. The guide helps the user to locate these trees along two nature trails. A section called "Ward's Island Roundup" briefly discusses some of the rich history of the island which was once the home of the Merechkawick Indians, sold by the Indians to the Dutch governor of the New Netherlands settlement in 1637, controlled by the British thirty years later and used as a military camp during the Revolutionary War. The islands' flowers, weeds, rocks, natural and man-made geography are described. A section is also devoted to consideration of the island's future. (BC)

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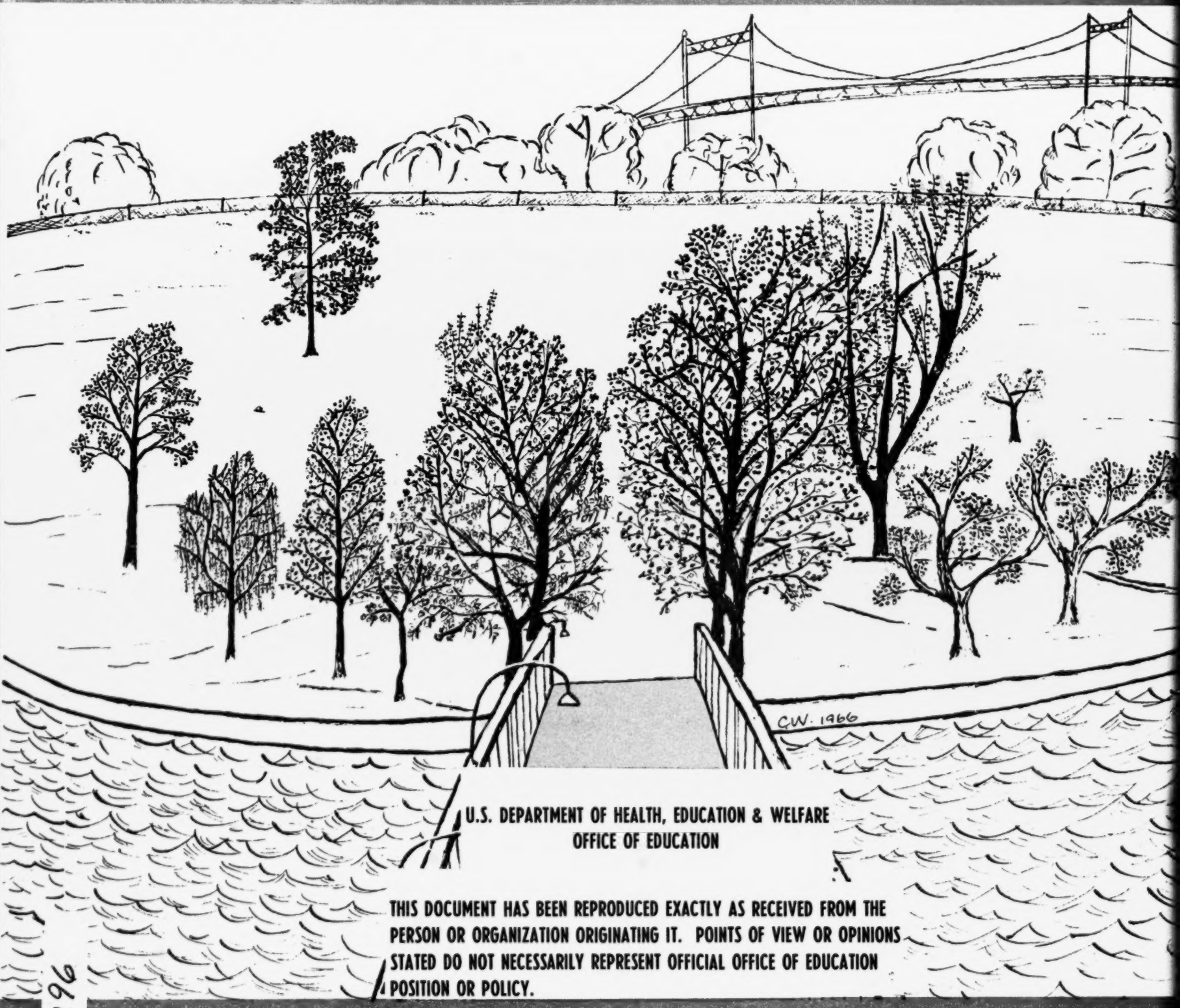
OPERATION WARD'S ISLAND

A Guide to the Trees and Other Features of Ward's Island



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OPERATION WARD'S ISLAND

A Guide to the Trees and Other Features of Ward's Island

●

Developed by

THE WARD'S ISLAND PROJECT

of the

MASSIVE ECONOMIC NEIGHBORHOOD DEVELOPMENT, INC.

in East Harlem, New York City

●

Made possible by a special grant from the

OFFICE OF ECONOMIC OPPORTUNITY

Washington, D.C.

●

Bureau of Curriculum Development
Board of Education of the City of New York

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FOREWORD

The footbridge that joins Manhattan to Ward's Island provides a path to a parkland which is of great value to our schools. *Operation Ward's Island* supplies information which makes it possible for teachers and children to utilize the Island as an outdoor laboratory. It contains a guide to 30 kinds of trees on the Island, along with descriptive material and clearly drawn illustrations. The guide helps children locate these trees on two nature trails: Trail 1, a short walk; Trail 2, the longer.

Operation Ward's Island offers many opportunities for learning: the unique geography of the Island can be explored with the help of useful maps; the constantly changing tide can be observed for its effect on navigation; and the landmarks visible on the city's skyline can be identified.

The pedestrian bridge that links Manhattan to Ward's Island offers a unique vantage point for seeing the city at work. The three tall smokestacks of Consolidated Edison call attention to an important source of energy and a controversial source of air pollution. Cars cross the Triborough Bridge on their way from one island to another. On a bluff in Carl Schurz Park stands Gracie Mansion, the Mayor's residence. At the foot of the bluff, a powerful fire-fighting boat is moored in constant readiness for emergencies. Other ships with other tasks move up and down the East River.

This guide beckons children to relive the history of New York from the time of the Merechkawick Indians to the present. It also challenges all of us to think of Ward's Island in the city of tomorrow.

Operation Ward's Island had its origin in an East Harlem project which was initiated by the Massive Economic Neighborhood Development, Inc., (MEND) in the summer of 1966 and financed by a grant from the United States Office of Economic Oportunity.

The Bureau of Curriculum Development of the Board of Education supplied its editorial and publication facilities to make this guide available.

Helene M. Lloyd
Acting Deputy Superintendent
Office of Curriculum

September 1967

Dedicated to the Children
of
East Harlem
and
to all who love trees

ACKNOWLEDGMENTS

The material for this publication was gathered in many ways and with the help of many people. *Operation Ward's Island* was developed in two stages. In the first stage, an East Harlem community project led to the creation of the original manuscript. In the second stage, the Bureau of Curriculum Development prepared the manuscript for printing and arranged for its publication.

STAGE 1

Mimosa Meisner, teacher at P.S. 83, Manhattan, and chairman of the Committee for the Greater Utilization of the Recreational Areas of Ward's Island, conceived the idea for the Ward's Island Project, wrote the original proposal, and participated in the writing of the manuscript.

Blorneva Selby, supervisor of the Metro-North Community Action Program of MEND and chairman of the Board of Advisors of the Ward's Island Project, guided the project from its initial stage to completion.

Groups responsible for proposing, supporting, and conducting the project were:

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Acknowledgment to the many enthusiastic students who participated in developing the material during the summer of 1966 is made on page vi.

STAGE 2

Julius Schwartz, Consultant in Science, Bureau of Curriculum Development, brought the original manuscript to the Curriculum Bureau, and followed it through to publication.

Muriel Green, Science Consultant, Bureau of Curriculum Development, was responsible for coordinating and preparing the materials for publication.

William H. Bristow, Assistant Superintendent, Bureau of Curriculum Development, reviewed and approved the manuscript and made available the resources of the Bureau for its publication.

Deep appreciation is expressed to Elizabeth A. Guthrie, of the City Gardens Club, for reviewing the material and making many helpful suggestions.

Appreciation is also expressed to Catherine Pessino, of the Education Department, American Museum of Natural History, for checking the accuracy of the drawings and manuscript.

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Fay Edwards, Director, Reading Clinic of East Harlem Protestant Parish
Helen Hall, Director, Bronx Botanical Garden
Barbara Neil, Senior Naturalist, Natural Science Center, American Museum of Natural History
Carl Schiff, Horticulturist, New York City Department of Parks
Doris Theiler, Assistant Principal, P.S. 83, Manhattan
Elizabeth Yarrow, Nature Specialist, Bronx Botanical Garden

Charles Wilson, Director and Graphic Artist of the Ward's Island Project, prepared the tree illustrations and the cover drawing. Paul Principato, Staff Instructor of the Project, prepared the maps and other drawings.

Photographs were obtained through the courtesy of the Triborough Bridge and Tunnel Authority.

The editing and production of this publication were under the direction of Aaron N. Slotkin, Editor, Bureau of Curriculum Development. Simon Shulman was responsible for the overall design, page, and cover layout. Edythe K. Kahn and Jan Margo edited the manuscript for publication.

HISTORY OF THE WARD'S ISLAND PROJECT

In the late spring of 1966 the New York City office of the antipoverty organization of the Office of Economic Opportunity offered local groups in East Harlem the opportunity to propose and direct programs they felt would benefit the community during the summer months. The community groups responded by submitting about 200 proposals to the local antipoverty organization of the Massive Economic Neighborhood Development, Inc. (MEND).

Among the ten proposals selected for funding was one which called for an instructional staff to work with 40 children in developing a nature guide for the trees on Ward's Island. The parkland of Ward's Island has long been a favorite place of rest and recreation for the residents of East Harlem. However, the potentialities of Ward's Island for nature study, social studies, and physical science study have seldom been used for the enrichment of school programs.

The proposed guide was to include descriptions and drawings of the twigs, leaves, fruit, and seeds of the 30 varieties of trees found on the Island and the winter outline of the trees when they are bare of leaves. The guide also would contain interesting historical data, maps, and descriptions of the physical landmarks of three boroughs (Manhattan, the Bronx, and Queens) that could be seen from the Pedestrian Bridge connecting Ward's Island to East Harlem.

The plan called for the printing and distribution of 15,000 copies of the guide to public and private schools, and to youth, scout, church, and community groups of East Harlem. In June 1966 the community action program of the Metro-North subcommunity of MEND was inaugurated. Under the leadership of Bloreeva Selby, supervisor of the program, and Mimosa Meisner, originator of the proposal and chairman of the Committee for the Greater Utilization of the Recreational Areas of Ward's Island, a board of advisors consisting of parents and teachers from the community was formed. Neighborhood schools cooperated by sending in the names of 65 interested children to the community office. At the same time, job descriptions and applications for staff positions were distributed. The Board of Advisors located skilled, talented personnel for the staff of the Ward's Island Project within its own community.

The end of the summer saw the completion of a "Nature-Study Guide to Ward's Island." Many experts in the field who read the manuscript praised it for its graphic and literary qualities. Unfortunately, however, funds for printing had not been provided under the terms of the grant, and the Board of Advisors of the Ward's Island Project became the custodian of an extremely valuable but unpublished manuscript.

At this time the Ward's Island Project received an invitation to attend a meeting of the Elementary School Science Association of New York (ESSA) whose members were eager to know of areas within the city that could be used by school groups for nature study.

Mimosa Meisner of the Ward's Island Project attended the meeting. She reported on the summer work of the 60 parents, teachers, and children associated with the project and displayed the manuscript of the "Nature-Study Guide to Ward's Island." Miss Meisner conveyed the determination of the community group to persist in its efforts to make copies of the Guide available to school children.

Julius Schwartz of the Bureau of Curriculum Development, who was present at the ESSA meeting, asked Miss Meisner to leave the manuscript with him. After reviewing the manuscript, he recommended that the Ward's Island Project submit it to the Bureau of Curriculum Development.

The manuscript was reviewed by William H. Bristow, Assistant Superintendent, Bureau of Curriculum Development, and Samuel Schenberg, Director, Office of Science Education. Superintendents Edward Scalea, of District 2, and Murray Hart, of District 4, expressed interest in the manuscript and urged that it be made available in their districts, which border on Ward's Island. Mrs. Helene M. Lloyd, Acting Deputy Superintendent, Office of Curriculum, approved the proposal to have the Board of Education publish the guide under the title *Operation Ward's Island.*

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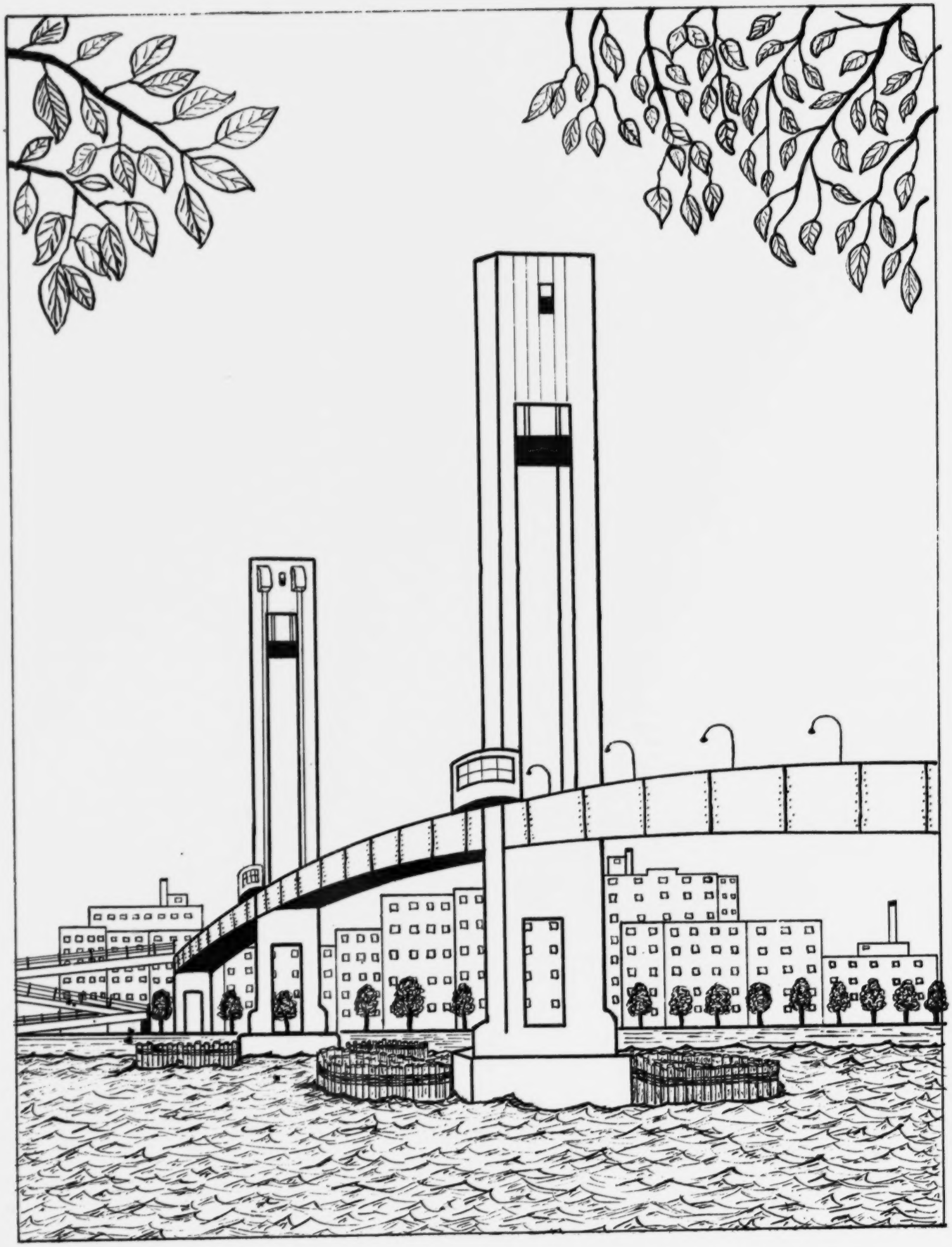


WARD'S ISLAND AS A RESOURCE

HOW TO USE THE NATURAL RESOURCES OF WARD'S ISLAND

The parkland of Ward's Island offers opportunities for a variety of educational experiences. Two nature trails beckon children to study 30 species of trees, each with its individual form and size, each with its distinctive bark, leaves, flowers, fruit, and seeds.

This guide helps children locate trees on two trails. *Trail 1* is a short walk; *Trail 2*, a longer one. It also will help them understand the history and the value of each tree.

As children revisit the trails, they see the changes that occur in the trees throughout the year. Observing the effects of adverse factors—a sudden frost in the spring after leaves have appeared, an exceptionally dry summer, a strong windstorm, the washing away of soil, an invasion of destructive insects—will help children understand the dependence of trees on their environment.

Except for the cutting of grass in the spring and fall, the gently rolling fields of Ward's Island remain in a natural, uncultivated state with wild flowers, grasses, and weeds. Insects considered helpful to plant life—butterflies, dragonflies, and bees—are seen. Destructive forms—bagworm moths, the larvae and adult stages of coddling moths and leaf miners—also are found.

Larger birds, including robins, flickers, woodpeckers, thrushes, and grackles, are especially in evidence. Smaller birds are heard and seen in flight; some of these nest in the thickly wooded section on the adjacent hospital grounds. Water birds, such as herring gulls, several types of smaller blackheaded gulls, coots, and mallard ducks, congregate along the south shore of Ward's Island at the time of an incoming tide. At other times they rest on the river water off nearby Mill Rock Island or perch on its rocky seawall.

On crossing the Pedestrian Bridge, one is struck by the huge volume of traffic on the East River, in the air, and over the roads, bridges, and railroad tracks. The ceaseless flow of traffic can be overwhelming; it is desirable that one aspect only be considered on each trip.

One trip could concern itself with bridges: the traffic overpass above the Franklin D. Roosevelt Drive, the Pedestrian Bridge itself, the East River suspension bridge and the Harlem River vertical-lift bridge of the Triborough complex, the arched Hell Gate Railway Bridge, the cantilevered Queensborough Bridge. Another trip might concern itself with islands: Mill Rock, Ward's, Randall's, Welfare, Long, and Manhattan Islands. Transportation may be the subject of a trip:

sky transportation with its many types of aircraft (jet planes, multiple- and single-engine propeller planes, helicopters for passengers, police, and Coast Guard, seaplanes with pontoons)

vehicular transportation with its trucks, passenger cars, service vehicles (e.g., fire engines, ambulances, and police cars)

railway transportation with the freight cars of many railways from different parts of the United States and with passenger trains serving the East, rolling over the Hell Gate Railway Bridge on their way in and out of the city

water transportation with its many and varied watercraft, such as barges and scows (transporting oil, sand, coal, rock, sewage sludge, train cars, and floating crane hoists), oceangoing freights and

warships (on their way to or from shipyards in Flushing Bay and Long Island Sound), fishing vessels, and a wide variety of pleasure craft, both motor and sail. The pleasure boats include hydrofoils and such unusual craft as houseboats and, at times, a Chinese junk.

From a point midway on the Pedestrian Bridge one enjoys a panoramic view of the city and three of its boroughs. Notable buildings, such as the Empire State Building, the Chrysler Building, and Gracie Mansion, can be seen, as well as local landmarks, such as nearby housing projects ,the peaks and spires of the older school buildings, the unusual structure of the Manhattan Asphalt Plant, the docks and shed of the Department of Sanitation collecting depot at 91st Street, the Marine Police boat station, the bowl of the Downing Stadium on Randall's Island, and the flashing time and temperature sign of a Bronx gas station.

A panoramic view of the city includes, unfortunately, obvious indications of air pollution. On a clear day children will notice the differences in visibility over midtown Manhattan, Queens, upper Manhattan, and the Bronx. As they observe dense smoke pouring from the three Con-Edison smokestacks in Queens just below the Queensboro Bridge as well as the smoke from factories and large apartment houses and compare it with the relatively clear air over Washington Heights, they will raise questions about the need for air-pollution control.

The study of air pollution, including its causes and its proposed cures, will lead to a discussion of water pollution. This is especially likely if the children walk along the waterfront and view the debris and oily scum deposited on the rocky shore and see the water thick with the sediment of open sewers which still empty into the East River.

Just as doctors study the function of the human body to seek cures for its ills, so children need to be interested in the functions and problems of their city and to study the proposals to solve the latter. From the study of the earth's natural resources they become aware of the fact that no physical matter is ever lost; it is converted into other forms of matter, water into water vapor, for example.

The recent trend to seek methods for the conversion of the ugly debris of a huge urban center into useful material is noteworthy. Sewage sludge that used to be dumped into the ocean now provides topsoil for parks and recreational areas (see page 17). The tons of fly ash from incinerators, the bane of housewives, may become an ingredient for a cement aggregate that can be used in pavements and building material.

The combustible trash of a huge city can be burned (under pollution-control regulations) to produce the steam to heat homes and run turbines. Many European cities already have disposal plants that not only help to pay for themselves but also produce useful products and services. Large cities in the United States, where water and air pollution problems are becoming very pressing, need citizens who understand the causes and effects of a polluted environment. Today's children will be those enlightened citizens of tomorrow.

To students of changes in the earth, Ward's Island is an interesting outdoor laboratory. The action of the tidal waters upon the south and east shores of Ward's Island is evidenced in changes in the land. The south shore of Ward's Island is protected by a jumble of rocks, old foundations, and other debris of construction work. This is called *riprap*. (See page 00.) It is, at best, an inadequate protection for a waterfront that is open to tides and storm waters.

In 1955 a hurricane brushed the city and wrought a good deal of havoc upon this south shore. The river walkway was in danger of being washed away, and a seawall was erected along the shore from the park boundary underneath the Pedestrian Bridge for approximately a half mile. At this point the funds allotted for the repair of the shoreline were depleted. To date, no further funds have been set aside for this purpose.

In the absence of a major storm, the damage done by tidal waters that nibble at the shore during each high tide is not dramatic. Yet a study of the 1951 map of Ward's Island discloses that literally thousands of square feet of parkland have disappeared, washed away by the East River.

The force of the East River cannot be gauged when we see its waters at ebb tide when they lap gently against the rocky shoreline. The approach of high tide, however, gives one a sense of the magnitude and force of moving water. Viewing the incoming tide from the south shore, one sees a great sheet of water clearly showing definite stream patterns. At the point of the small, offshore lighthouse where a low shelf of rock is visible at ebb tide, the water cascades down in a miniature waterfall. Junior and senior high school students, with the aid of their teachers, might devise methods of determining the speed and direction of the moving water.

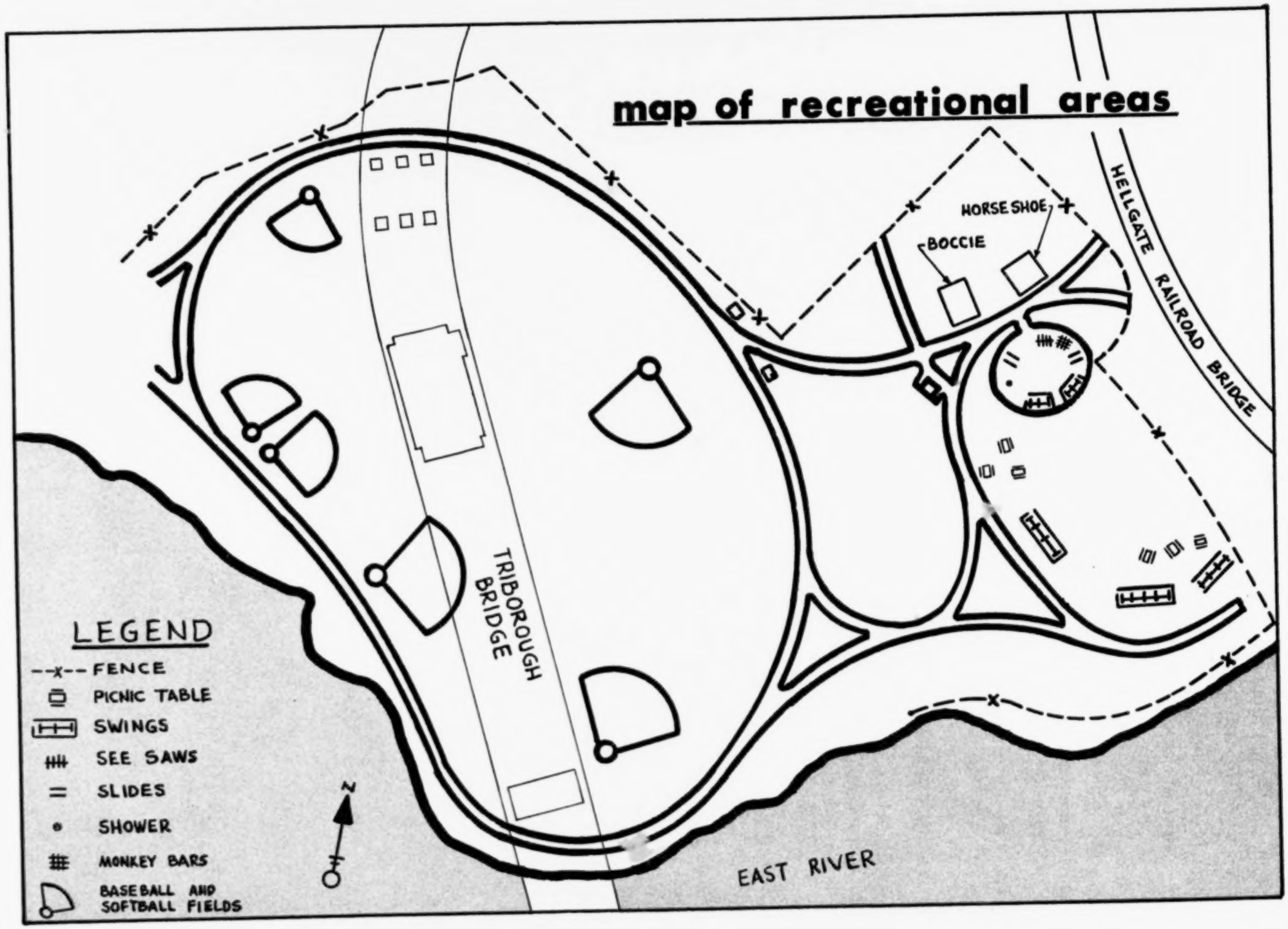
The virtually uninterrupted view of the sky from Ward's Island is an invitation to city youngsters to study clouds. Billowy cumulus clouds and wispy cirrus clouds can be evaluated as weather signs.

HOW TO VISIT WARD'S ISLAND WITH A GROUP

Ward's Island may be reached on foot by public transportation (see page 7) or by school bus. School buses should travel east on 106th Street as far as the Franklin D. Roosevelt Drive. At this point there is no access to the Drive. There is an inner road which runs adjacent to the Drive down to 105th Street where it turns west through the Wilson and East River Housing Projects. This is a sheltered road.

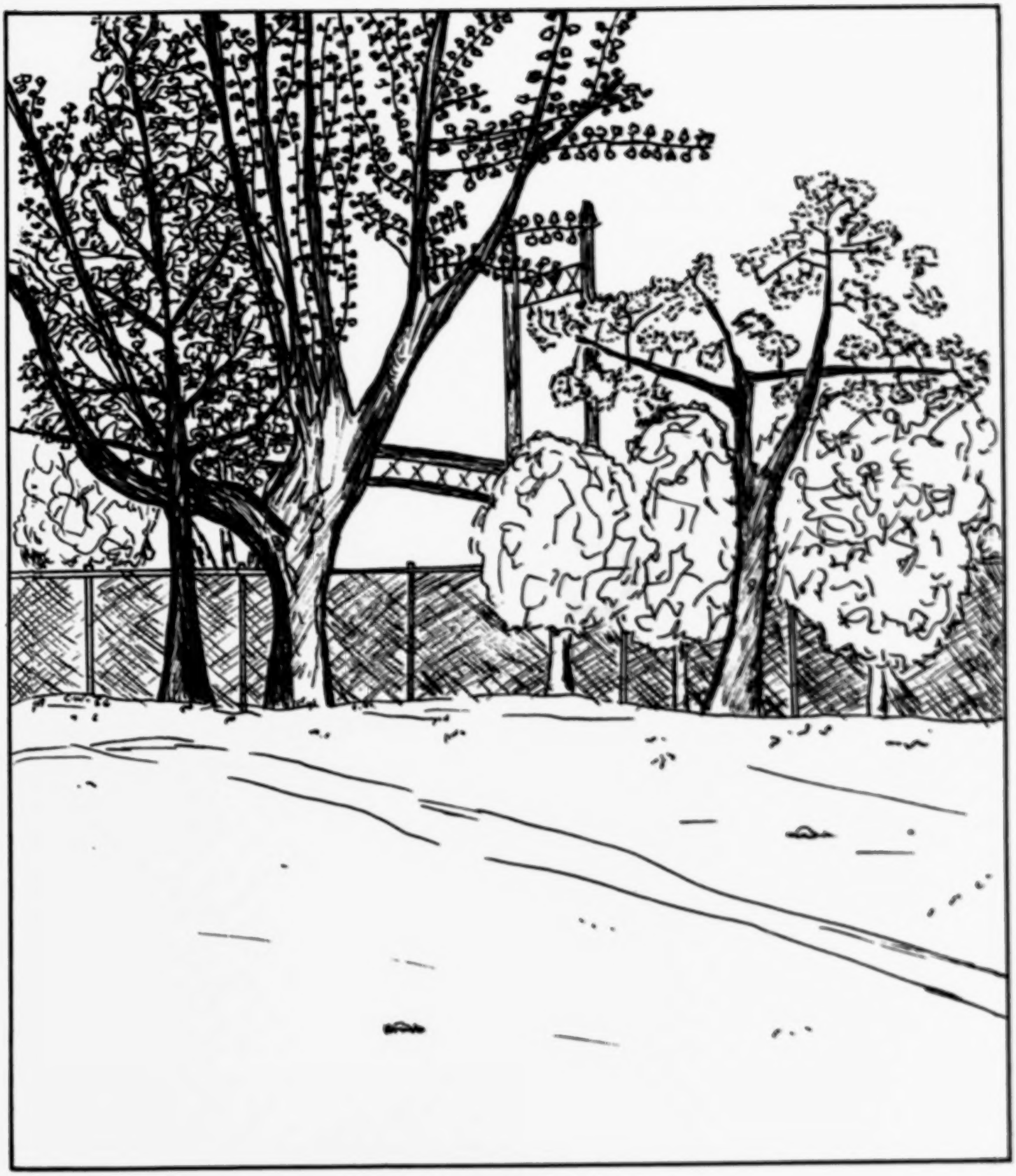
At the point where the inner road reaches 105th Street, visitors should walk to the overpass at 103rd Street. There are two ways:

1. Walk along the Drive to the ramp and overpass. If the children are overexcited, this may not be a good choice as it is noisy and the speeding traffic alongside may be a hazard. The view of the overpass and the Pedestrian Bridge is, however, desirable.
2. Walk through the East River Housing Project which starts at the north end of the playground and skirts it.


map of recreational areas
HELLGATE RAILROAD BRIDGE
HORSE SHOE
BOCCIE
TRIBOROUGH BRIDGE
EAST RIVER
LEGEND
FENCE
PICNIC TABLE
SWINGS
SEE SAWS
SLIDES
SHOWER
MONKEY BARS
BASEBALL AND SOFTBALL FIELDS
N

HOW TO LOCATE FACILITIES ON WARD'S ISLAND

- There are two control cabins on the Pedestrian Bridge with bridge attendants present at all times. The Police Department Marine and Aviation Division (stationed on Randall's Island) patrols Ward's Island regularly. It is advisable to let them know that you are going to be there.
- Recreational areas are located about a ten-minute walk from the Pedestrian Bridge where the Triborough Bridge spans the island and beyond this point to the adjoining hillside. Ball fields, swings, slides, and seesaws are available.
- The toilet facilities on Ward's Island are near the Hell Gate Bridge, approximately one mile from the Pedestrian Bridge. The first water fountain is located about one-half mile from this bridge.
- Cookouts are possible in the Hell Gate area where fireplaces and picnic benches are available. This is near the comfort station and the station of the Department of Parks attendant.



WARD'S ISLAND ROUNDUP

INTRODUCTION TO WARD'S ISLAND

Ward's Island is in the middle of the East River. It is surrounded by East Harlem on the west, Astoria (Queens) on the east, Randall's Island on the north, and by the Hell Gate waterway on the south.

Hell Gate is a channel of deep water between Ward's Island and the Astoria shore. Its odd name probably comes from the Dutch *Helle-gat*, a name given to a difficult water passage near Rotterdam in Holland. The men who work the boats on the East River can tell you that Hell Gate lives up to its name, especially at high tide when even the powerful tugboats have a hard time battling the tidal current.

The Triborough Bridge, which connects the three boroughs of Manhattan, Bronx, and Queens, uses Ward's Island as a stepping stone for two of its concrete abutments.

The Pedestrian Bridge which connects Ward's Island with East Harlem enables people to reach the parkland on the island. The midsection of this bridge can be raised to allow tall ships to pass beneath it.

How Do You Get to Ward's Island?

On foot:

Walk to the overpass at East 103rd Street and the East River Drive; cross the Pedestrian Bridge to Ward's Island.

By public bus:

First Avenue or Second Avenue bus; Third Avenue or Lexington Avenue bus; Madison Avenue or Fifth Avenue bus. Get off at East 104th Street; walk east to the overpass at East 103rd Street and the East River Drive; cross the Pedestrian Bridge.

By subway:

Take East Side Lexington Avenue IRT train to the East 103rd Street station; walk to the overpass at East 103rd Street and the East River Drive; cross the Pedestrian Bridge.

Did You Know

- that the Merechkawick clan of the Carnarsie Indians owned Ward's Island? (They may have watched the gulls or gone fishing as we do now.)
- that Indian chiefs Seyseys and Numers sold the island to the Dutch governor of the New Netherlands settlement in 1637?
- that the British took control of the island 30 years later and made it a military camp during the Revolutionary War?
- that the Indians called the island Tenkenas; the Dutch called it Great Barnes Island; the British called it Buchanan's Island; and when it was bought by two farmers, Jasper and Bartholomew Ward, it finally received the name it has now, Ward's Island?

- that during the War of 1812 a cotton mill was operated on Ward's Island to weave cloth for the uniforms of American soldiers? (At that time there was a bridge at East 114th Street connecting Ward's Island to East Harlem.)
- that in 1860, an immigration station was established on Ward's Island for the many newcomers to the United States who sought freedom and a better life in the New World?
- that, when a larger immigration station was established on Ellis Island in Upper New York Bay, the Ward's Island buildings were converted for use by the New York State Department of Mental Hygiene?
- that the large, modern buildings of the present Manhattan State Hospital were built in 1940 after a disastrous fire leveled many of the older buildings?
- that one of the three largest sewage disposal plants in the world was constructed on the east shore of Ward's Island to reduce the pollution of the city's waters? (A similar plant is planned for the Hudson River in the near future.)
- that the Department of Parks designated a large portion on the south shore of Ward's Island as parkland and constructed the Pedestrian Bridge in 1949 so that people could reach its grassy hills and fields?
- that a destructive hurricane in 1955 washed away thousands of square feet of parkland along the south shore? Part of the waterfront has been repaired, but in other sections the tidal waters of the East River still reach beyond the riprap and wash away the shoreland.

When You Visit Ward's Island Think of All Who Have Been There:

The Indians cooking at their campfires, hunting, and fishing

The British Redcoats polishing their rifles and drilling

The Ward brothers plowing and tilling their farmland

The workers in the cotton mill walking across the bridge

The immigrants looking at the strange new land of America

THE VIEW FROM THE PEDESTRIAN BRIDGE

As you walk over the Pedestrian Bridge, stop a moment and observe points of interest in all directions. (Use your compass, if you have one, to find the directions.)

To the North

Randall's Island

Benjamin Franklin High School

Jefferson Park

The pier at 107th Street

The police boat pier on Ward's Island

Manhattan State Hospital

To the South

Mill Rock Island

Carl Schurz Park and Gracie Mansion

The fireboat station

The Empire State Building

The Chrysler Building

Welfare Island and Queensborough Bridge

To the East

Ward's Island Park

The Triborough Bridge

The Hell Gate Railway Bridge

The sewage disposal plant

Astoria Park in Queens

To the West

The East River Houses

The Wilson Houses

Junior High School 99

Metropolitan Hospital

Metropolitan Hospital Nurses Residence

The green spires of Public School 109

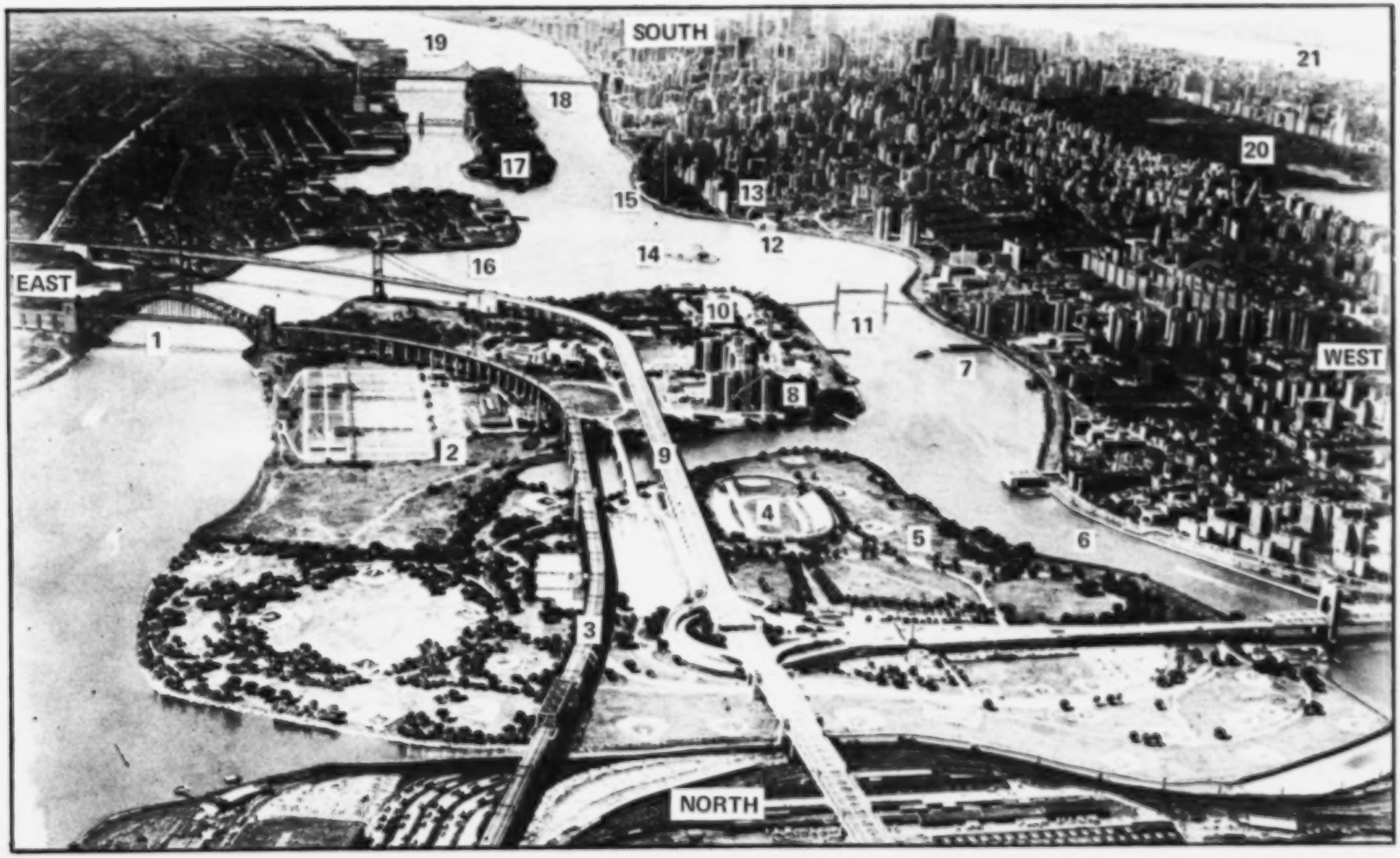
In the Water and in the Sky

Can you read the water and sky signs, and do you know what they mean?

Is the tide coming in or is it going out? Watch paper on the water. In what direction does it go? Is the wind blowing it, or does the water carry it?

Look at the sky. Is there smoke coming from the Consolidated Edison smokestacks? In which direction does it go? Where is the air clearer, over Brooklyn or over upper Manhattan? Why? What does the sky tell you about tomorrow's weather?

What does the sign on the bridge mean: CLEARANCE 55 FEET ABOVE M H W (Mean High Water)?



OVERVIEW OF WARD'S ISLAND AREA

1. Hell Gate Railway Bridge
2. Sewage Disposal Plant
3. New Haven Railroad
4. Downing Stadium
5. Randall's Island
6. Harlem River
7. Recreation Pier
8. Manhattan State Hospital
9. Triborough Highway
10. Ward's Island
11. Pedestrian Bridge (Midsection Raised)
12. Sanitation Department Collection Depot
13. Asphalt Plant
14. Mill Rock Island
15. Carl Schurz Park
16. Hell Gate
17. Welfare Island
18. Queensborough Bridge
19. East River
20. Central Park
21. Hudson River

OVERVIEW OF THE WARD'S ISLAND AREA

Looking at the two islands, Ward's and Randall's, from the Mott Haven neighborhood of the southeast Bronx (see map on page 10), we see the circle of the Triborough elevated highway in the foreground. The spurs of the Bronx- and Queens-bound sections join the Manhattan section at this point. A central spur leads down and around to the parkland of Randall's Island and thence to the Manhattan State Hospital on Ward's Island. The railroad tracks run parallel to, and to the left of the Triborough Highway. Food and supplies for New York City are transported over these tracks in long freight trains. A great variety of boxcars, flatcars, and tankcars often end their journey in the Mott Haven freight yards.

At the left is the Hell Gate Railway Bridge which crosses one of the most dangerous waterways in the metropolitan area. The graceful Triborough Bridge crosses the Hell Gate rapids just south of the Railway Bridge. These bridges are so high that even large oceangoing freighters and warships can go under them.

The Hell Gate section of the East River is reported to be about 70 feet deep, but it is quite narrow. Its narrowness at this point gives the tidal water greatly added force as can be seen in the speed of watercraft going with the tide, and the labored, almost unnoticeable progress of watercraft going against the tide.

The settling tanks and buildings of the Sewage Disposal Plant on the east shore of Ward's Island are just north of the Hell Gate Railway Bridge. (For more information, see "Ward's Island Disposal Plant" on pages 16, 17.)

The Little Hell Gate waterway separates Ward's and Randall's Islands. This waterway has now been partly filled in, thus joining the two islands.

Downing Stadium, the scene of many sporting and cultural events, is at the right of the Triborough Bridge on Randall's Island. It is surrounded by rolling green grassland, ballfield, play areas, walkways, and a large parking area which is situated near the stadium between the Triborough Bridge approaches and the railway tracks. A small bridge over Little Hell Gate leads to the restricted grounds of Manhattan State Hospital. Visitors to the hospital use a Transit Authority bus to reach this area.

Several clay tennis courts are situated to the east of the parking area. A permit from the Department of Parks is needed to play on them. A maintenance shop of the Department of Parks is based in Downing Stadium. Permission for groups to use the track and field of the stadium for practice sessions may be obtained here. The Marine Division of the New York City Police Department has a station in the Triborough Circle. Comfort stations are located adjacent to the police station.

Looking farther south toward Ward's Island, we see the skyscraper buildings of Manhattan State Hospital clustered on the northwest corner. There is a small pier jutting into the placid waters of the Harlem River where a patrol boat of the Marine Division of the Police Department is stationed. On the East Harlem side the large recreation pier at East 107th Street juts into the river. An overhanging roof makes this a pleasant place to sit and enjoy the river breezes in the summer. Anglers try their luck at catching East River eels, and others dream of the day when a marina for small boats may be constructed in the area.

To the south of the recreation pier we see the Pedestrian Bridge which provides access to the parkland of Ward's Isiand for the people of East Harlem. Although the section of the East River at this point does not have as much commercial water traffic as the Hell Gate section, it is necessary that the Pedestrian Bridge be raised at times. Its midsection then lifts vertically, aided by a huge counterweight at each end. As the weights go down, the bridge goes up, much as sash weights in window frames do. (For more information see "Islands, Bridges, and Waterways" on page 14.)

Directly to the south is tiny Mill Rock Island whose sheltered harbor is used as a resting place by migrating wild ducks and other water fowl. At present, this small island has very little vegetation. The same hurricane that swept away a large portion of the waterfront of Ward's Island in 1955 also inundated Mill Rock Island and carried away its topsoil. The Triborough Bridge and Tunnel Authority is now making Mill Rock Island a sanctuary for birds. Topsoil has been added and plantings will follow. The waterfront will be reinforced.

Further south is Welfare Island with the Queensborough Bridge soaring high over the buildings of the Bird S. Coler Memorial Hospital and Home for Aged People. A small bridge connects Welfare Island to the mainland of Queens. On the northern tip of the island, just opposite Carl Schurz Park, is a small landing field used by Police Department helicopters.

On a bluff in Carl Schurz Park stands Gracie Mansion, the beautiful residence of the mayor of New York City. Its white columns can be seen through the trees of the park. A tall flagpole displays the flags of the United States and of New York City. At the foot of the bluff is a firehouse and a pier of the New York City Fire Department. Its powerful fire-fighting boat, the Robert F. Wagner, is moored here in readiness to respond to emergencies. A helicopter landing pad has recently been constructed at the end of the fireboat pier. This is for the emergency use of the mayor should it be necessary for him to reach his offices in downtown Manhattan faster than automobile traffic allows.

A few blocks north of the fireboat pier is the collecting station and pier of the Department of Sanitation. All day long the heavy trucks of the Sanitation Department drive up the ramp over the Franklin D. Roosevelt Drive to dump their load of rubbish and trash into large scows. Tugboats arrive at stated times to collect the laden scows and push them downriver to the ocean. Followed by flocks of seagulls, the scows are pushed many miles away from shore where trapdoors are opened and the rubbish and trash dumped into the ocean.

The arched concrete building near the Sanitation Department pier is a Borough of Manhattan asphalt plant. Much of the asphalt that patches and paves the streets of Manhattan comes from this plant.

It is fortunate for the people living in upper Yorkville and lower East Harlem that the prevailing westerly winds carry away and disperse over the East River the unpleasant odors and clouds of dust and ashes emanating from the sanitation collecting depot. All urban centers must dispose of their waste products without displeasing side effects. On the east side of New York City, this problem has been partly solved by the strategic placing of a sewage disposal plant and sanitation collecting depot which utilize natural wind patterns.

WHERE THE WILD FLOWERS AND WEEDS GROW

The parkland of Ward's Island has a rich selection of beautiful and interesting wild plants. Feathery seed heads of timothy grass grow in thick clumps along the rivers walkway near the ball fields. Rye, wheat, and oat grasses grow along the foot of the hill near the cookout area. Crabgrass and chickweed can be found everywhere. Crabgrass is not always regarded with friendly eyes by people who take care of lawns. Yet, its spreading stems do serve the useful purpose of holding and protecting the soil from the winds that might blow it away.

The plateau area, near the footbridge, was once the site of a garden. Much of it was lawn as it is now. However, a circular portion of a different type of grass indicates the site of a former flowerbed. The kindergarten children of the nearby East Harlem schools look upon this green circle of grass with special favor. To them it looks like a fairy circle where wild rabbits and squirrels might gather at night.

We see other evidence of the existence of a forgotten garden. Beneath the Austrian pine near the fence, a large area is covered with purple crocuses very early in the spring. Their bright orange centers

peek through the spring snow. These crocuses are apparent survivors of the planted gardens that existed before the area became parkland. Indeed each year finds an increase in the number of flowers. Even the families of wild rabbits that live near the worksheds of the hospital do not destroy them.

Bright yellow butter-and-egg plants with their orchid-like blossoms grow best around the rocky waterfront. They are joined by many types of clovers: sweet clover, red clover, white clover, and hop clover. The clear blue flowers of chicory and an occasional purple vetch plant decorate a countryside that is seldom found in urban city areas.

A low-lying area near the triangle where the river road and the inner road separate is a favorite place for primroses, bindweed, wild morning glories, red clovers, and all kinds of flowering grasses.

Dandelions can be found everywhere and in all stages of development. Their favorite place is the plateau area. In spring they almost cover the site with their bright yellow flowers and white fluffy candles. In lesser numbers they are found throughout the growing season on the island. Some picnickers stop on their way to the cookout area to pick tender dandelion leaves to use as salad greens, after washing them carefully in drinking water. Purslane, another delicious salad green, can be found along the fence near the inner road. Asiatic day flowers, smartweed, and purple heartweed also grow here.

The gently sloping hillside of the picnic area near the Hell Gate Bridge is a favorite growing place for yarrow, Queen Anne's lace, and a great variety of tall, flowering grasses. Buttercups and small patches of cinquefoil have been found here. Plantain, both the English and the cattail, are found everywhere.

Milkweed is found only behind the fence at the waterfront under the Hell Gate Bridge. It is sparse, and apparently the prevailing winds have blown all the milkweed seeds toward Astoria since very few additional plants are grown from year to year. Goldenrod grows in this same site, but it is also very sparse, perhaps for the same reason.

Seedlings of maple and ailanthus can be found. These usually are cut off by the machine that mows the area during the spring.

An occasional morning glory, some false buckwheat, and the local ivy called *a-mile-a-minute* can be found beside and climbing on the steel fence along the inner road near the small brick powerhouse. The plant called nightshade, which has poisonous berries, can be found at times in the same general area as well as at the clifflike waterfront under the Hell Gate Bridge.

ROCKS OF WARD'S ISLAND

There are only two small outcroppings of rock on the parkland of Ward's Island: one near the mulberry tree on the first Nature Trail and one near the hawthorne tree on the hill near the second Nature Trail. These two outcroppings are of the type of rock commonly known as Manhattan schist, which can be found in Central Park, Morningside Park, and other areas of open land in Manhattan where rock formations are visible on the surface.

Since the waterfront of Ward's Island is constructed of riprap, there are opportunities to observe and perhaps collect small samples of a large variety of rocks. This is because riprap consists of the debris from erection and demolition activities connected with road, bridge, and building construction programs. Huge chunks of rock originating in distant mountains and excavations, as well as great masses of concrete, brick, or stone building foundations, have been transported from other regions and dumped along the waterfront of Ward's Island to form a barrier to the tidal waters of the East River. Thus we can see chunks of granite, sandstone, quartz, schist, feldspar, mica, hornblende, limestone, slate, among others. Crystal formations in these rocks may be observed.

The action of tidal water, temperature changes, and wind can be noted on the different parts of the massed riprap. Rocks that were observed on one visit may later be found to have moved or broken into smaller pieces. A rock that has been cracked will probably present a fresh surface. The clear surfaces of the crystals can then be seen. In a rare instance, fossils may be seen.

A sampling of small specimens was taken to a geologist at the Museum of Natural History. He identified red sandstone dating from the era of the dinosaurs, a small piece of petrified wood, and a fragment of rock which is found only in a region near Boston. One's imagination might well spin a tale of the travels of this fragment from its original site to its place in a schoolroom collection. Was it the kind of rock that might have been used to construct a fireplace in a home that was later demolished? Was it once part of a farmer's stone fence that was broken down for road construction? Or was it picked up in a load of dirt around the roots of a tree that was to be transplanted? Who knows?

There is another type of rocky substance on the shores of Ward's Island which has an interesting history. This is formed of huge chunks of molten metal and stone and resembles descriptions of the surface of the moon because of its jagged, porous look. When a group of school children, alerted by the government's plea to the public to look for meteorites that might have fallen from outer space, took a sample of this substance to a geologist, they found that it was slag from a blast furnace. It was slag with a history, however. Empty ships returning from Antwerp to New York were loaded with ballast consisting of this slag from a blast furnace in Antwerp so that they would be weighted and steadier in the rough waters of the Atlantic Ocean.

ISLANDS, BRIDGES, AND WATERWAYS

Islands are bodies of land surrounded on all sides by water. Tiny Mill Rock Island, near the south shore of Ward's Island, can be seen in its entirety from the Pedestrian Bridge. There is a lighthouse on this island which warns ships to avoid its dangerous, rocky shores. A tiny harbor provides a safe mooring place for small boats. Flocks of herring gulls frequent Mill Rock Island since it is a protected nesting place. Large flocks of migrating wild ducks and coots visit the island on their flights from the north. It is hoped that with the new plantings on the island by the Triborough Bridge and Tunnel Authority more birds will be attracted to it and perhaps nest there.

A peninsula is a long narrow body of land surrounded on three sides by water and attached to a mainland. Part of Astoria in Queens juts out into the East River in just such a way. The Astoria Houses, a public housing project, are built on this peninsula. Its shores are protected from the tidal waters of the East River by strong wooden pilings and stone walls.

To the south of Ward's Island, past Mill Rock Island and the Astoria Houses peninsula, the tip of Welfare Island can be seen. This island contains many hospital buildings devoted to the care of the aged and sick people of the city. There are also a station and helicopter landing field which belong to the Marine and Aviation Department of the Police Department. The New York City Fire Department carries out and extensive training program for its staff on the island. It uses several old abandoned buildings to teach fire-fighting and rescue skills.

There are numerous bridges and tunnels connecting Manhattan to Long Island and to the mainland of New Jersey and the Bronx.* From a vantage point midway on the Pedestrian Bridge to Ward's Island seven of the many bridges in the area can be seen. These bridges are constructed for particular purposes.

The Pedestrian Bridge itself is a narrow vertical-lift bridge. It is approached via a ramped cross walk—a bridge over the Franklin D. Roosevelt Drive at East 103rd Street. Cars may not use this

*The Triborough Bridge and Tunnel Authority and the Department of Public Works of the City of New York are excellent sources of information on local bridges.

bridge. The midsection of this vertical-lift bridge is raised when it becomes necessary to provide more room for a passing vessel. The floating hoist crane operated by the New Haven Railroad, which carries heavy rolls of wire to the Washburn Wire Company at 119th Street, is one of the craft which require the raising of this bridge.

At such times, a signal blast from the vessel while it is still a distance away alerts the bridge tenders in the control cabins at the foot of each lift tower. Closing the gates to pedestrian traffic, they set into motion the machinery which allows the great counterweights at the top of each tower to descend slowly. This action pulls up the midsection of the bridge in the same way that sash weights at each side of a double-hung window raise the window. Window-sash weights are made of lead and shaped like a sausage just wide enough to fit into the grooved window frames. The counterweights suspended from the vertical-lift towers are as large as a small house, and are constructed of concrete encased in steel.

Randall's and Ward's Islands can be reached by auto and bus via a road spur from the Triborough Bridge. But the heavy traffic of the Triborough Bridge does not touch these peaceful islands.

Due north at the point where the Triborough Bridge system crosses the Harlem River near its Bronx-Queens-Manhattan junction point on Randall's Island, the towers of the Harlem River Bridge can be seen. This bridge, like the Pedestrian Bridge, is a vertical-lift bridge, but of a much more massive construction since it must support the great amount of auto and truck traffic that streams in both directions between the three boroughs.

Toward the northeast the steel structures of the Bronx Kill Bridge and its approaches to the junction point can be seen against the sky. The Bronx Kill Bridge has a truss construction in which the steel framework of the bridge is set upon concrete supports. The Bronx Kill is a minor waterway, seldom used by vessels.

The East River Bridge of the Triborough complex soars high above the East River. This bridge continues over Astoria Park into Queens where it joins one of the intricate network of highways in the metropolitan area. It is a suspension bridge: two cables carry the weight of the entire structure across the width of the East River, and its roadways hang suspended from these cables in a strong but elastic balance. This is in contrast both to the unyielding construction of a truss bridge standing foursquare on its concrete supports, and the need of a vertical-lift bridge to have its "feet" in the water.

Running parallel to the Triborough viaduct highway and Bridge are the tracks and bridge of the Lehigh Valley and New Haven Railways. The tracks are also mounted on a viaduct, and the bridge for them crosses the river several hundred feet north of the East River section of the Triborough Bridge. The railway bridge is of steel arch construction. It bears the name Hell Gate Railway Bridge, after the waterway of the East River over which it passes.

The Queensboro Bridge is of cantilevered construction, although to a viewer it looks like a suspension bridge. Its two main spans cross the two channels of the East River on each side of Welfare Island. They are marked by the two pointed turrets. Instead of the steel cables that support the bed of a steel suspension bridge, the Queensboro Bridge is supported by a network of diagonally placed steel girders.

As originally planned, this bridge was to carry four tracks on its upper deck for trolleys and subway trains. But when another cantilevered bridge under construction in Quebec collapsed, the calculations concerning weights and stress were restudied. It was found that the dead weight of the bridge itself was already so great that one pair of tracks had to be eliminated. This made it necessary for the city to construct a subway tube under the East River.

The structure of the Queensboro Bridge looks clumsy and too massive for beauty, especially when compared with the East River suspension bridge of the Triborough complex. Nevertheless, it is a most

useful and needed bridge. Its several decks carry a tremendous load of vehicular traffic to and from Manhattan and Queens. The trolley lines have long been discontinued and replaced with buses.

Hell Gate is situated at a point where the shores of Ward's Island and Astoria approach each other. The East River is wide up to the point beneath the Railway Bridge where Hell Gate narrows it to less than half its width.

The effect on the narrowing waters is that of a bottleneck. This is not apparent at ebb tide when water from Long Island Sound flows quietly through Hell Gate down the East River and into the Upper New York Bay. However, incoming tidal waters meeting the downflow of the East River wells up with furious energy at the "neck of the bottle" in the Hell Gate area. Here waves with treacherous undertows and dangerously erratic currents may reach a height of ten feet.

This turbulence is a real danger to shipping. Oceanbound freighters which pass through the Hell Gate rapids on their way to and from the shipyards of Flushing Bay and beyond often need the services of one or more tugboats, especially when they have no cargo. In such instances, the ship rides so high in the water that its propeller is visible. It churns the water only slightly since the propelling power is provided by the tugs. On a windless day one tug may tow such a vessel on a single cable. On a windy, gusty day, the services of two or more tugboats are required. Hugging the sides of the hulking freighter, the tugs guide it by pushing and butting it into the right channel.

Vessels approaching each other from either side of the river must signal their passing intentions. It is the pilot of the freighter and not of the tugboats escorting the vessel who signals with a shrill whistle blast.

Fully laden vesels, such as low-lying oil tankers or heavily armored warships, do not need the services of tugboats. They usually take advantage of the tidal flows when they can move silently with great speed through the turbulent waters.

FREIGHT TRAINS AND PASSENGER TRAINS

The Hell Gate Railway Bridge over the East River carries long freight trains loaded with food and supplies for the Metropolitan area from points in the Midwest and the South. The names of many railroads can be found on various types of freight cars–flatcars, boxcars, tank cars, stock cars, and refrigerated cars.

We see their names–the Chesapeake and Ohio, the New Haven, the Pennsylvania, Central of New Jersey, the Lehigh Valley–and we wonder how they were all collected, where they are going, and where they came from.

The trains from southern regions terminate at Greenville, New Jersey. Greenville is located just below Hoboken, at the edge of New York Harbor and directly across the harbor from Bay Ridge in Brooklyn. At Greenville the Central cars are waterborne on railway barges to Bay Ridge where they are assembled into long freight trains with the cars of other railroads. From Bay Ridge these freight trains travel across Brooklyn and Queens, finally reaching the Hell Gate Bridge where we see them chugging slowly across Ward's Island and Randall's Island on viaduct tracks toward the Bronx.

In the Bronx, at the Oakpoint Station, the food and supplies bound for the Metropolitan area are unloaded; trucks then transport these materials to their final destination.

WARD'S ISLAND DISPOSAL PLANT

The sewage of a large part of Manhattan, Queens, and the Bronx is treated at the disposal plant on Ward's Island. Once one of the largest in the world, the Ward's Island Plant is soon to be eclipsed by the Newtown Creek Disposal Plant in Brooklyn.

At the Ward's Island Disposal Plant, raw sewage is pumped up from huge interceptor tunnels. It is passed through a grit chamber, then pumped into settling tanks where sedimentation takes place through various processes. The effluent is drawn off and rendered harmless. The raw sludge is transported to the Atlantic Ocean and dumped twelve miles offshore.

At present all the sewage disposal plants in the city, except the Ward's Island Disposal Plant, use a digestion process. This process is a method by which the action of bacteria, over a period of several weeks, can render the raw sludge not only harmless but also useful.

The residue of the digestion process combined with sand is used by the Department of Parks to create topsoil for many landfill areas in the city. It is estimated that more than one million cubic yards of topsoil will be required for newly created parkland in the next few years. Commercial purchase and transportation of this amount of soil would cost at least $5,000,000.

With an increase in the possible uses of raw sludge produced by the digestion method, it is possible that the Ward's Island Disposal Plant may soon convert to this useful sewage disposal process.

WHAT WILL WARD'S ISLAND BE LIKE IN THE FUTURE?

At the present time the parkland of Ward's Island is in a semi-cultivated state. Although the trees are well cared for by periodic spraying against destructive pests and by pruning of dead and diseased tree limbs, the grassland of Ward's Island is kept in its natural state. This allows wild grasses and weeds to complete their normal cycle of flower growth and seed development.

Community and school groups seek to beautify the parkland by planting wild and cultivated seeds and plants that can be expected to survive in the area. These include clumps of lily-of-the-valley, wild violets, blue flags, day lilies, wild strawberries, periwinkles, field daisies, blackeyed Susans, and others. The seeds are those of petunias, hollyhocks, lantanas, and morning glories. These are planted along the length of the steel-mesh fence separating the parkland from the hospital grounds, thus bringing the color and fragrance of flowers to all who are on Ward's Island. The parkland along the fence provides a variety of conditions—sunny and shady, wet and dry—and, therefore, is suitable for each variety.

Although the parkland of Ward's Island may be enjoyed in its natural state for some time, it is inevitable that the future will bring many changes. There are Department of Parks plans for the construction of a promenade and bicycle trails along the river.

A plan for the joining of Ward's Island to Randall's Island by filling in the Little Hell Gate waterway is already in process. This is being done by the Triborough Bridge and Tunnel Authority, and this section is now known as Sunken Meadows. It is destined in the near future to become parkland with walks, benches, playing fields, and playgrounds. Since this area is near the southeast Bronx, a ramped walk is being planned which will extend from the Triborough highway to enable East Bronx people to approach Sunken Meadows on foot. It is envisioned that a portion of the Little Hell Gate waterway will become a marina for pleasure boats as the East Harlem waterfront area is expanded into an extended upper East Side luxury apartment section.

A recently proposed architectural project called "The New City" suggests that the joined Ward's - Randall's Islands area be connected to the mainland of East Harlem from 96th to 106th Streets and from 116th to 125th Streets, thus leaving a body of water as an inland lake for swimming and boating. The added land would become an area on which new housing for our growing city could be built. The parkland of Ward's Island, as it now is, would be retained. The Bronx Kill waterway, in this case, would be enlarged and dredged to accommodate the shipping that now uses the section from the East River to the Harlem River.

FACTS AND FIGURES

WARD'S ISLAND is located in the East River, south of Randall's Island, near the point where the three boroughs of the Bronx, Manhattan, and Queens meet. The island covers 255 acres. It is the site of the grounds and buildings of the Manhattan State Hospital (northwest part of the island); the site of the Ward's Island Disposal Plant (northeast part of the island); and the Ward's Island recreational parkland with ball fields, play areas, nature study trails, and a social science laboratory field site.

RANDALL'S ISLAND has a area of 194 acres. It is just north of Ward's Island near the boundaries of the Bronx, Manhattan, and Queens in the East River. The grounds and buildings of the Triborough Bridge and Tunnel Authority are located here. It also is the site of Downing Stadium. Tennis courts, a recreational area with ball fields, and several play areas are on the island.

MILL ROCK ISLAND, a sanctuary for birds, is also in the East River. It is located directly south of Ward's Island.

WELFARE ISLAND, covering an area of 139 acres, is also south of Ward's Island. It is in the East River, opposite East 57th to East 87th Streets in Manhattan and Long Island City in Queens. This island is the site of a testing and training area for the New York City Fire Department (southern end of the island). The Marine and Aviation Division of the New York City Police Department maintains a helicopter station on the island. The grounds and buildings of the Bird S. Coler Hospital for the aged and sick of New York City are located on the island.

The EAST RIVER is not a true river since it does not originate in uplands. It is only a passageway between New York harbor and Long Island Sound. The currents of the East River are the tidal flows between these bodies of water.

The East River is very wide except at a point beneath the Hell Gate Railway Bridge where it suddenly narrows to less than half its width. This Hell Gate section of the river develops strong and treacherous currents, erratic high waves, and general turbulence at the time of incoming tides. At this time, it is very dangerous for shipping.

Incoming tidal waters can be seen most vividly at the point on the south shore of Ward's Island where a small lighthouse marks the presence of a submerged shelf of rock. At the beginning of high tide, a massive wall of water drops over this rocky shelf.

The HARLEM RIVER, a placid, slow-moving waterway, is a branch of the Hudson River. It is responsible for making Manhattan an island. Its waters join those of the East River at the point where Ward's Island is located.

LITTLE HELL GATE is a small body of water between Ward's and Randall's Islands. At present, it is being filled in by the Triborough Bridge and Tunnel Authority as part of a plan to create more parkland and to provide room for the expansion of the sewage disposal plant. The filled-in part is on the east side of Ward's Island; the west side empties into the Harlem River and will, in the future, become a marina for pleasure boats.

BRONX KILL, a shallow, almost dried-up body of water, separates Randall's Island from the mainland of the Bronx. It may play a more active role as a waterway if a recently proposed plan for the Ward's and Randall's Islands area is carried out. This plan for "The New City" calls for joining the islands to Manhattan at 125th and 96th Streets and for the diversion of Harlem River and East River traffic through the Bronx Kill.

TRIBOROUGH SYSTEM

Location: spans the East River, Harlem River, and the Bronx Kill; connects the boroughs of Manhattan, the Bronx, and Queens
Types of bridges: truss, vertical lift, and suspension connected by viaducts
Length of Queens to Bronx section: 2 1/3 miles
Length of Manhattan section to junction: 3/4 mile
Total length: 3 miles
Traffic carried: 48,413,801 vehicles (in 1964)
Cost: $60,300,000
Construction period: 1929-1936
Toll: $.25

TRIBOROUGH - HARLEM RIVER BRIDGE

Location: between East Harlem in Manhattan and Randall's Island
Type: vertical lift
Length of lift span: 310 feet
Length of lift span and side spans: 770 feet
Weight of lift span: 2,050 tons
Width between trusses: 75 1/2 feet
Height of towers: 215 feet above mean high water
Normal underclearance: 55 feet above mean high water
Raised position underclearance: 135 feet above mean high water

TRIBOROUGH - BRONX KILLS BRIDGE

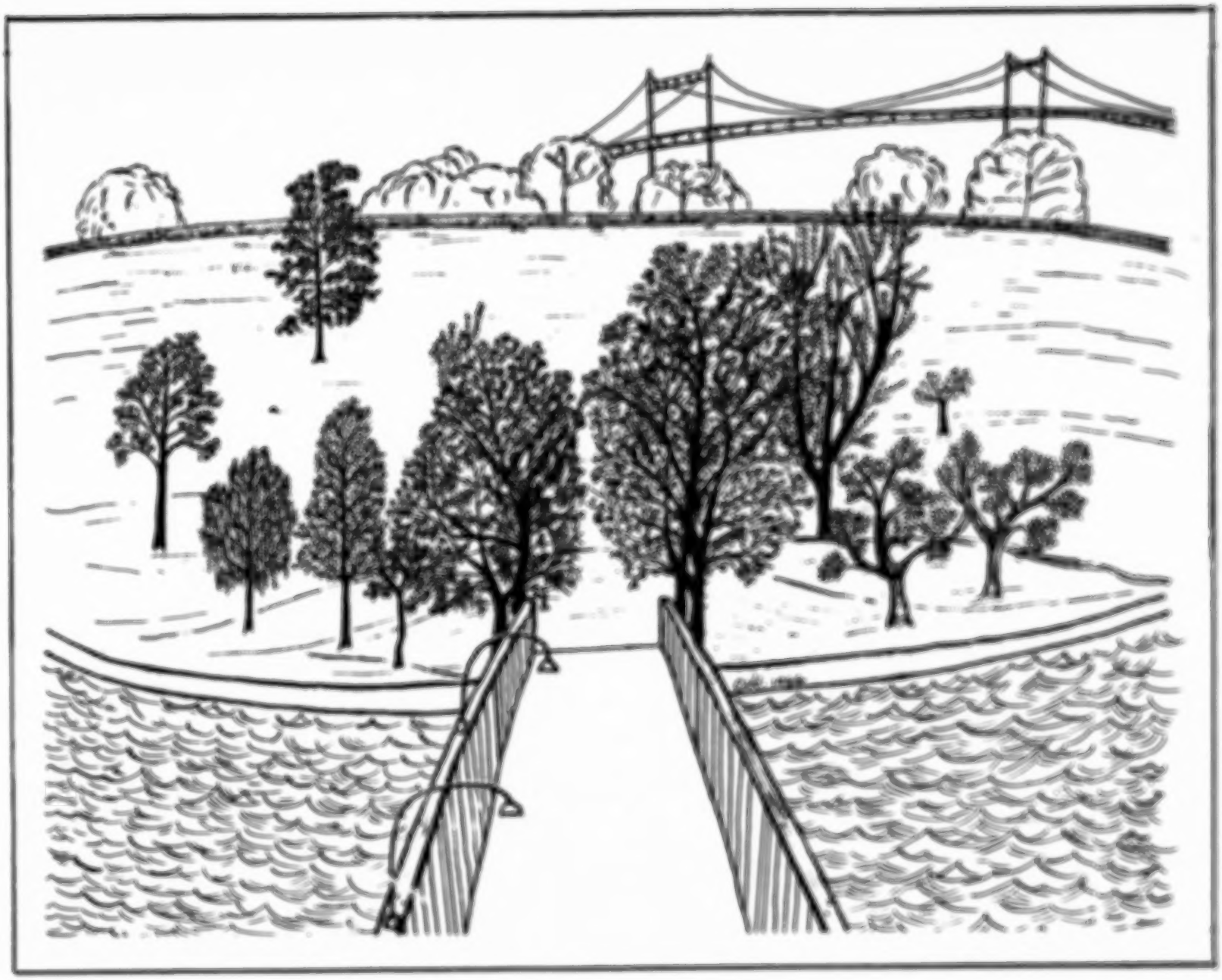
Location: between Mott Haven in southeast Bronx and Randall's Island
Type: truss bridge
Length of main truss span: 383 feet
Width between trusses: 95 1/2 feet
Length of approach truss spans: 1/4 mile

TRIBOROUGH - EAST RIVER BRIDGE

Location: between Astoria in Queens and Ward's Island
Type: two-cable suspension bridge
Length of main span between towers: 1,380 feet
Height of towers: 315 feet above mean high water
Underclearance of main span: 143 feet above mean high water
Steel in suspended structure: 10,000 tons
Width between cables: 98 feet
Diameter of cables: 20 5/8 inches
Contents of cable: 37 strands of 248 wires each
Total length of all wires: 10,800 miles
Length between anchorages: 2,780 feet

WARD'S ISLAND PEDESTRIAN BRIDGE

Location: between 103rd Street and Franklin D. Roosevelt Drive in East Harlem and Ward's Island
Type: vertical-lift bridge
Length of lift span and side spans: 956 feet
Normal underclearance: 55 feet above mean high water
Raised position underclearance: 135 feet above mean high water



TREES OF WARD'S ISLAND

GETTING TO KNOW TREES

Ward's Island has many kinds of trees. At first it may seem difficult to tell them apart, but when you become familiar with their characteristics—their special shape, their bark, branches, leaves, flowers, fruits, and seeds—you will be able to recognize them as easily as old friends.

Leaves

Some trees are *evergreen*: they keep their leaves all year, even in winter. Of the 30 kinds of trees that you will find on the nature trails, two, the Austrian Pine and the Japanese Black Pine, are evergreen. Both have needlelike waxy leaves. (This information will help you distinguish these two trees from the other twenty-eight. Later you will learn how to tell the two pines apart.)

Some trees are *deciduous*: they lose their leaves in the fall. (That is how autumn got its more popular name, fall.) Maples, oaks, and elms are deciduous trees.

In some cases the leaves are divided into smaller leaflets, as in the ash and the ailanthus. These are called *compound leaves*. Single, undivided leaves, such as those of the maple and oak, are called *simple leaves*.

Most people identify trees by the shape of the leaves. For example, the leaf may be long and needlelike, as in the pine, or broad and flat, as in the maple. The leaf may be lobed, as in most oaks. The edge of the leaf may be smooth, as in the catalpa, or it may be toothed, as in the birch and linden.

The arrangement of leaves varies on different kinds of trees. Some leaves are *opposite* each other on the twigs, as in the white ash. Others, such as the hawthorn, have leaves that are *alternate*, like the footholds on an electric utility pole. The leaves of most trees are positioned in spirals along the branches.

When leaves fall, we can see the shape of the place where the leaf stem was attached to the branch. This spot is called the *leaf scar*. We can identify many trees by their distinctive leaf scars.

Bark

Trees can frequently be recognized by their bark. Tree bark, like our own skin, is a protective covering. It shields the trees from harmful insects and microscopic forms of life which cause plant diseases. When examining the bark of trees we must be careful not to injure it. Some trees have rough bark, some smooth. The white oak bark has a shingled appearance, like the shingles of a house. The bark of the native birch is gray, with large black markings. The bark of a young silver maple is smooth and gray; the bark of older maples becomes reddish brown and develops rough scales.

Flowers and Seeds

Because the flowers of most trees are small and inconspicuous, many people do not realize that trees have flowers at all. In the spring and summer, we can identify some trees by their flowers; later, by their fruits and seeds. All of us are familiar with the oak's acorns and with the winged seeds of the maple.

Inside the flower are the organs of reproduction for the tree. There are two important structures–the *stamen* and the *pistil.* The stamen is the male organ of reproduction. It produces millions of pollen grains, each of which contains a sperm cell. The pistil, the female organ, produces egg cells. When the pollen is blown by the wind or carried by insects from a stamen to a pistil, the sperm is in a position to reach the egg and unite with it. The union of sperm and egg is called *fertilization.* The fertilized egg cell is the beginning of a new tree. Later the part of the pistil containing the eggs develops into a fruit and the eggs develop into seeds.

Seeds are scattered in different ways. Some are equipped with wings or parachutes and are easily blown about by the wind. Some simply drop to the ground and may roll a bit. Some, such as acorns, may be buried by squirrels; forgotten by the squirrels, they take root.

In some kinds of trees, the tulip, for example, all the flowers have pistils and stamens. In some trees, such as oaks, some flowers have only stamens, other flowers only pistils. These are called *staminate* and *pistillate* flowers. In some trees, all of the staminate flowers are one tree, all the pistillate flowers on another. In these cases we speak of a male tree and a female tree. Examples of such trees are the ailanthus and the ginkgo.

Shape

We have discussed the characteristics of parts of trees, but you will probably get to know many of the trees by their general shape. The tulip tree can be recognized by its tall, straight trunk; the American elm by its graceful "vase" shape; the copper beech by its wide-spreading branches; the pin oak by its slender branches which hang down like a skirt around the tree; the weeping willow by its graceful drooping branches.

The Names of Trees

A tree may have many different common names. For example, one tree is known as the sycamore or buttonwood or plane tree. In other countries it may have other common names. For this reason scientists have given each tree (and all other plants and animals as well) a single *scientific name* which is the same all over the world.

The scientific name is made of two words. For example, the scientific name of the tree we call buttonwood or plane tree or sycamore is *Platanus occidentalis;* that of the pin oak is *Quercus palustris.* The first part of the name is called the *genus* and the second is called the *species. Quercus* is the genus, *palustris,* the species. The scarlet oak has the name *Quercus coccinea.* Notice that both the pin oak and the scarlet oak have the same genus name. The scientific name shows their relationship.

In some cases the genus and the common name are the same. *Gingko biloba* is commonly called the ginkgo tree. In most cases the species name tells something about the tree. For example, *bi* in *biloba* refers to the fact that ginkgo leaves have two lobes. The scientific name of the white ash, *Fraxinus americana,* tells us that it is a native of America.

Scientific names (which are in Latin) may seem strange at first, but when you get to know them you may enjoy saying them; some of them sound quite musical. For example:

Ulmus americana (American elm)

Acer saccharinum (silver maple)

Salix babylonica (weeping willow)

For some of the 30 trees on the trails, only the genus name has been given because the species name for a particular tree may still be uncertain. An example of this is the hawthorn tree.

There are 30 species of trees on Ward's Island, that is 30 different *kinds* of trees. Of course the total number of trees is much more than that. Incidentally, almost 1200 species of trees are native to our country. Many others have been introduced here from abroad.

Trees Are Alive

As you visit the same trees and get to know them better you will notice changes in them. Leaves and flowers appear on the bare branches in spring. Later, seeds are seen. In autumn the branches become bare again.

It is harder to notice that the tree is growing. Trees grow in two ways: in length and in thickness. Growth in length takes place only at the tips of the main stem and branches. Away from the tips, along the branches and the trunk, the tree increases in thickness only. *Growth rings* show each year's growth. Roots, like branches, grow longer from their tips.

Trees are living things. Like animals, they need various *foods.* However, trees make their own food from raw materials in the earth and the air. The raw materials are water, minerals, and carbon dioxide. Millions of root hairs on the roots of the tree take water and minerals from the soil. These raw materials then go through tubes in the roots, trunk, and branches up to the leaves. Each leaf has thousands of tiny openings through which air enters. The leaf cells take carbon dioxide out of the air. The "machinery" for the manufacture of food in the leaf "factory" is the green *chlorophyl.* The energy needed for food-making is supplied by the sunlight shining on the leaves. So, with water, minerals, and carbon dioxide as raw materials, with chlorophyl as the machinery, and with sunlight as the source of energy, food is manufactured in the leaves of a tree. The manufactured foods go to all living parts of the tree where they are used for growing, or stored for future use.

Trees Are Important

Trees are important to people. Their wood supplies us with lumber for such things as furniture, pencils, and baseball bats. Through the wonders of chemistry, wood also supplies us with paper, clothing, and photographic film. Trees produce fruits that we eat, rubber and turpentine, and some drugs, such as quinine for the treatment of malaria.

Leaves rot after they fall, and the soil is enriched with their minerals. Trees benefit the soil in other ways. Their leaves and branches break the fall of raindrops. Their roots grip and hold the soil and protect it from being blown or washed away. The thick layer of rotting leaves holds water like a sponge and helps to prevent spring floods.

Trees are also important to animals. For example, many birds and squirrels find shelter and build nests in their branches. Blue jays and squirrels eat the acorns of the oak tree. Insects feeding on tree leaves are eaten by warblers and other birds. Bees and butterflies go to tree flowers for nectar.

Not only do we welcome the cool shade under a tree on a hot summer day, but we also enjoy the beauty and majesty of the trees. This enjoyment cannot be measured in dollars and cents. So, as we become acquainted with the handsome trees on Ward's Island, we should think of them as valued friends whose company we enjoy and whose worth we appreciate.

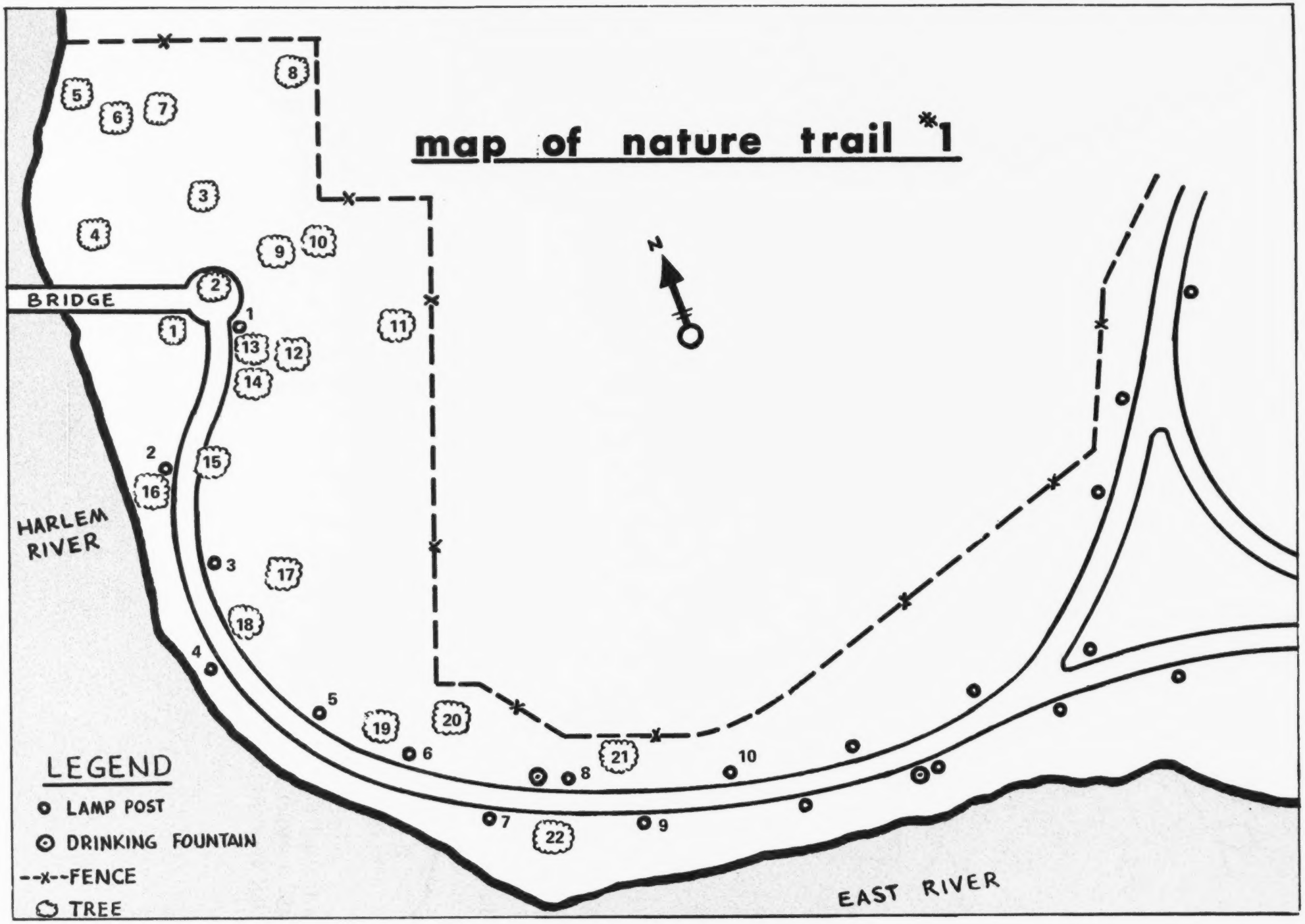
TREES FOUND ON NATURE TRAIL #1*

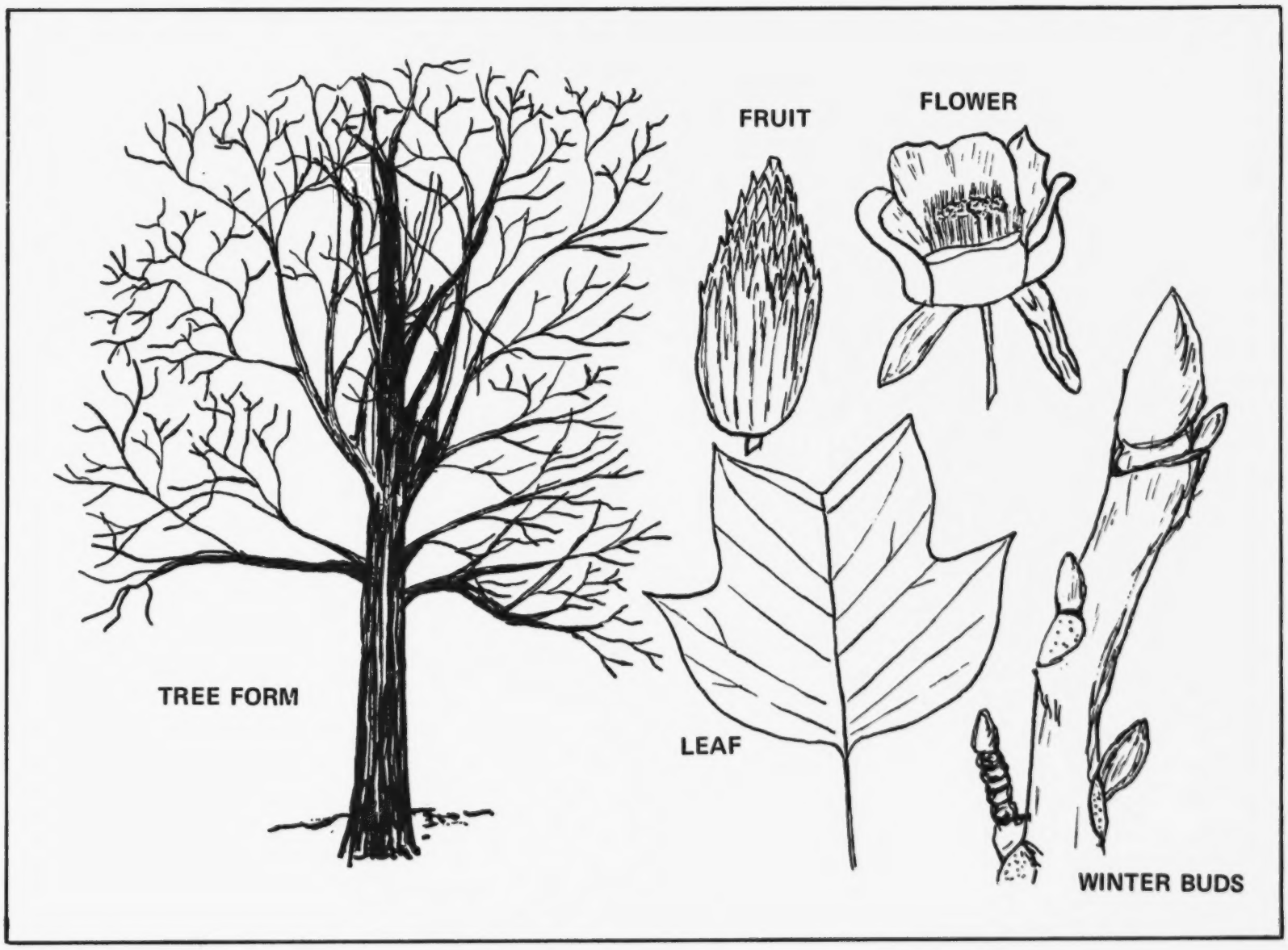
1. TULIP TREE
2. HORSE CHESTNUT
3. CHINA TREE
4. EUROPEAN WHITE BIRCH
5. SLIPPERY ELM
6. WILD BLACK CHERRY
7. WHITE ASH
8. HAWTHORN
9. COPPER BEECH
10. CATALPA
11. AUSTRIAN PINE
12. GINGKO
13. SYCAMORE
14. JAPANESE BLACK PINE
15. LINDEN
16. EASTERN COTTONWOOD
17. NORWAY MAPLE
18. WHITE MULBERRY
19. AILANTHUS
20. SWEET GUM
21. SWAMP WHITE OAK
22. PIN OAK

The number preceding the name of each tree listed above corresponds with the number of that tree on the map facing this page. The lampposts on the trail are numbered and are also indicated on the map. They serve as location points for the Park Department. They are helpful in identifying nearby trees. Descriptions and illustrations of the trees are found on the pages that follow.

*Nature Trail #1 begins at the foot of the bridge and includes the plateau area from the shore to the fence bordering the park area. It continues along the river road almost to the concrete abutments of the Triborough Bridge where the circular path begins.

map of nature trail *1

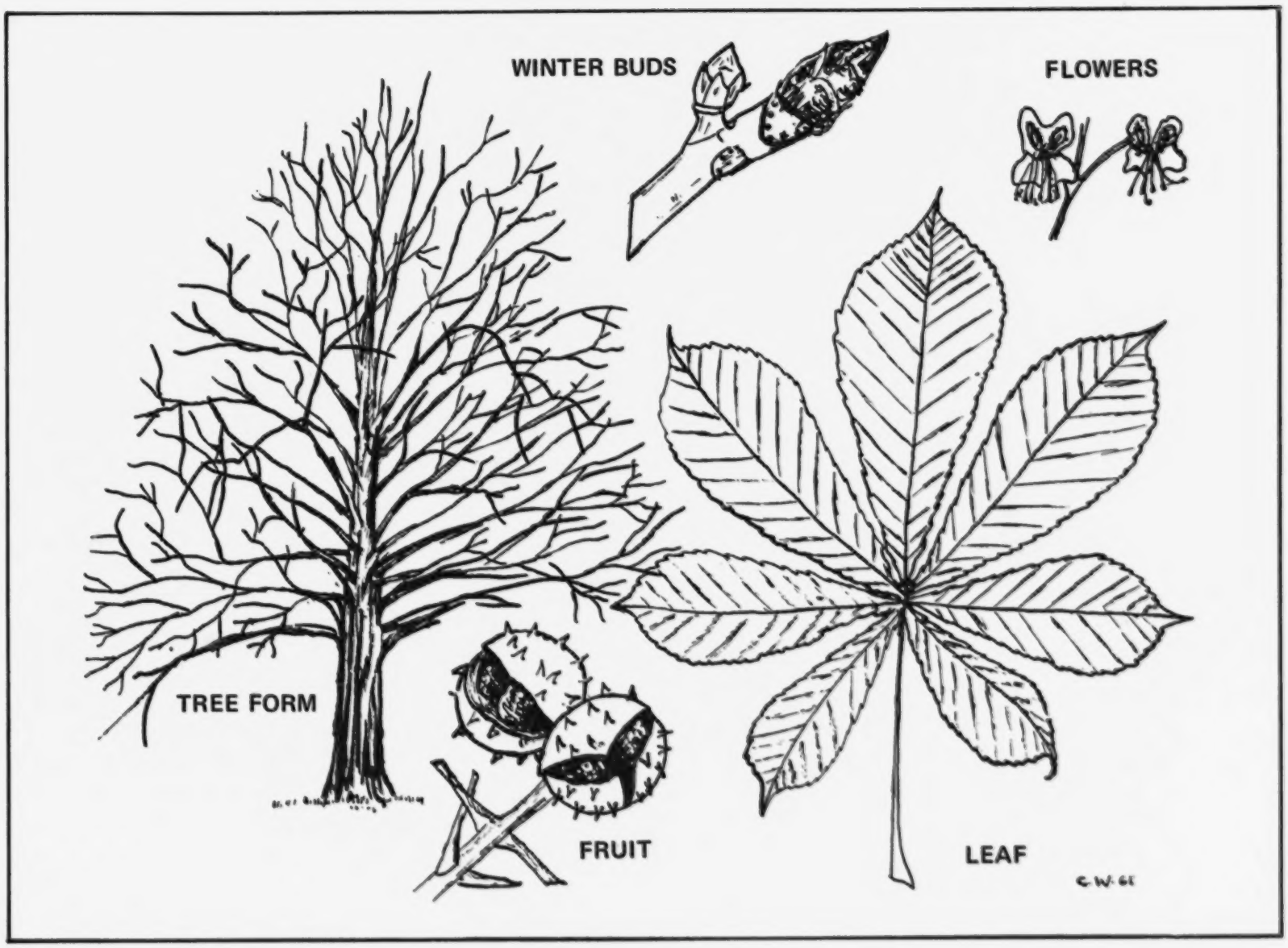




1. TULIP TREE (Lirodendron tulipfera)

The tulip tree has a tall straight trunk. It is one of the trees that grew on Manhattan Island when Indian tribes lived here. The leaf of this tree is glossy and smooth. In May and June beautiful tulip-like flowers appear near the ends of the branches. They are greenish-yellow and become orange toward the end of the blooming period. The developing fruit is a green spike that turns into a light brown cone in the fall. The cone opens up into a loose seed cluster. The winged seeds are carried away by winter winds.

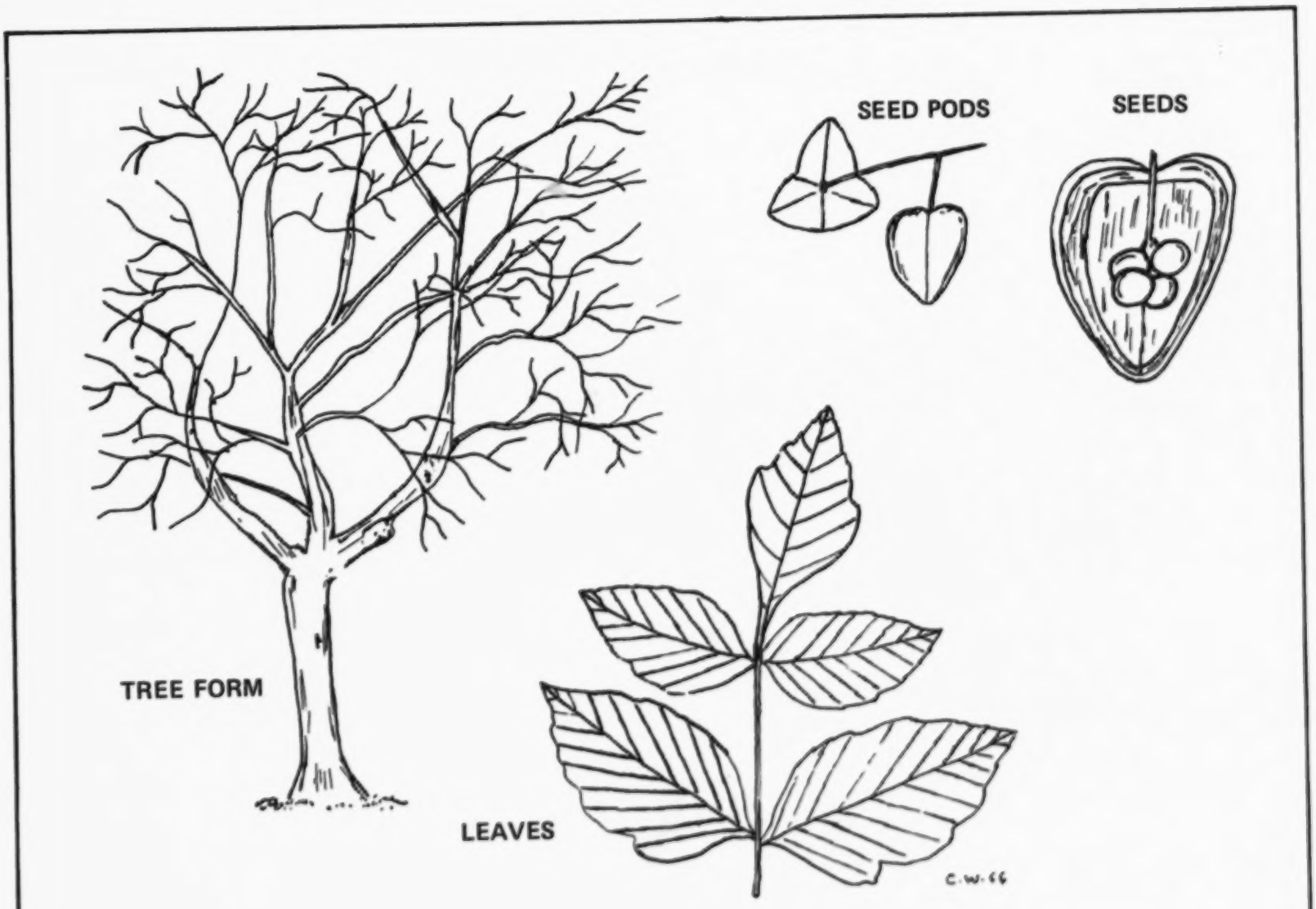
In the fall the handsome green leaves turn a golden yellow. They do not stay on the tree very long but make a carpet underneath the tree. The bark of the tulip tree is gray and smooth when the tree is young but develops furrows as the tree gets older.



2. HORSE CHESTNUT (Aesculus hippocastanum)

This is one of the first trees we see as we approach Ward's Island on the footbridge. Looking straight ahead beyond the tulip tree branches that tower on the right, we see the horse chestnut in the semicircle of benches at the end of the bridge. This tree is common in Europe and is prized as a large, spreading, shade tree. The leaves are palmate: the leaflets are arranged like the fingers of a hand when the palm is shown. Each leaf has five to seven leaflets, five to nine inches long, which are pale green on the underside.

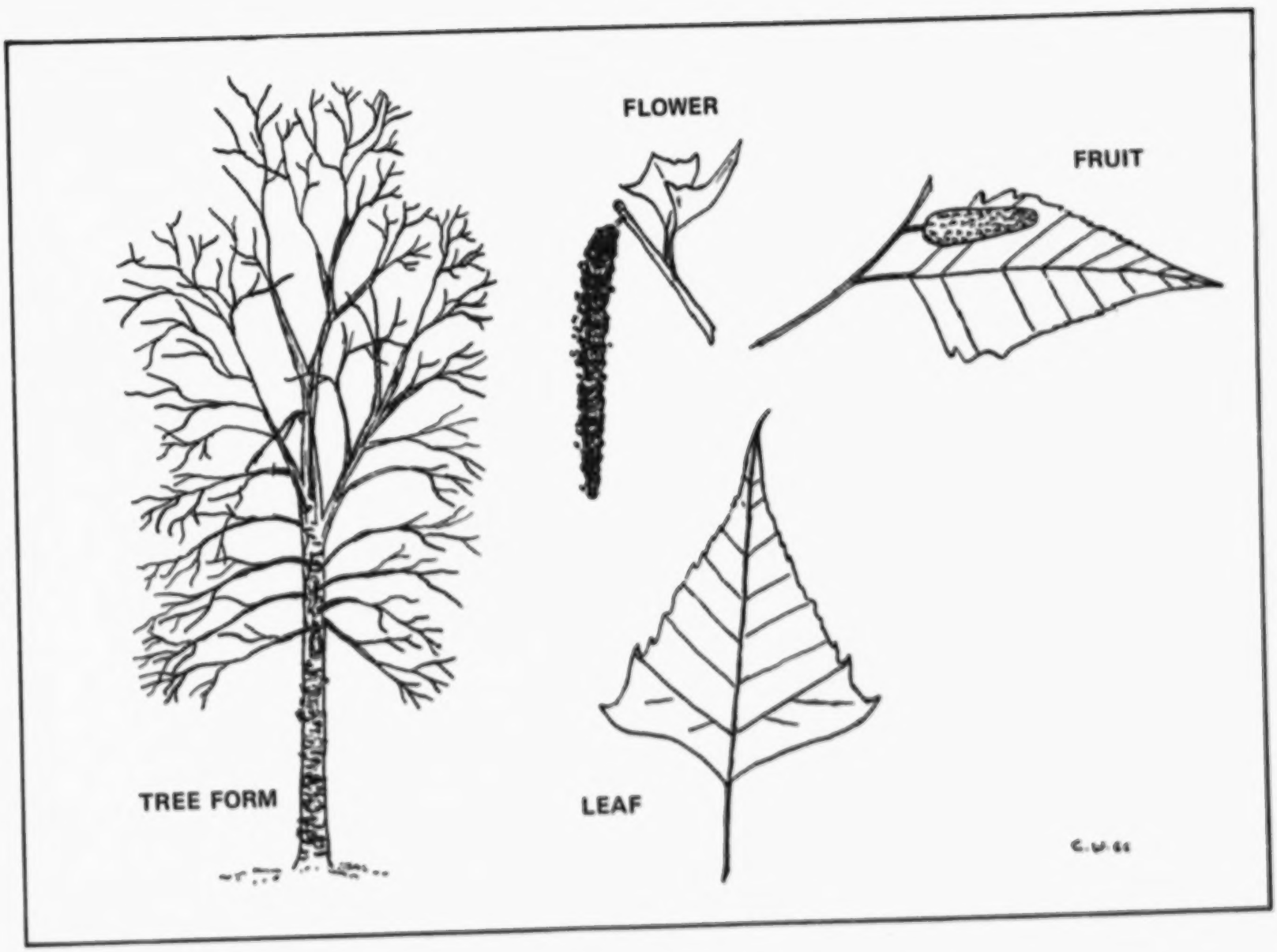
In the spring, the showy white flowers grow upright on the ends of the branches. They look like wide-based candelabra and are very fragrant. When the flowers bloom in May, watch for bees and other insects that are attracted to their nectar and pollen. In the fall the leaves turn yellow, then brown. The fruit is large, round, and spiny. When it drops to the ground the husk breaks open, revealing two or three smooth, shiny, brown nuts, each with a light spot on it. Unfortunately, these nuts are poisonous to people although squirrels seem to feast on them without harmful effects.



3. CHINA TREE (Koelreuteria paniculata)

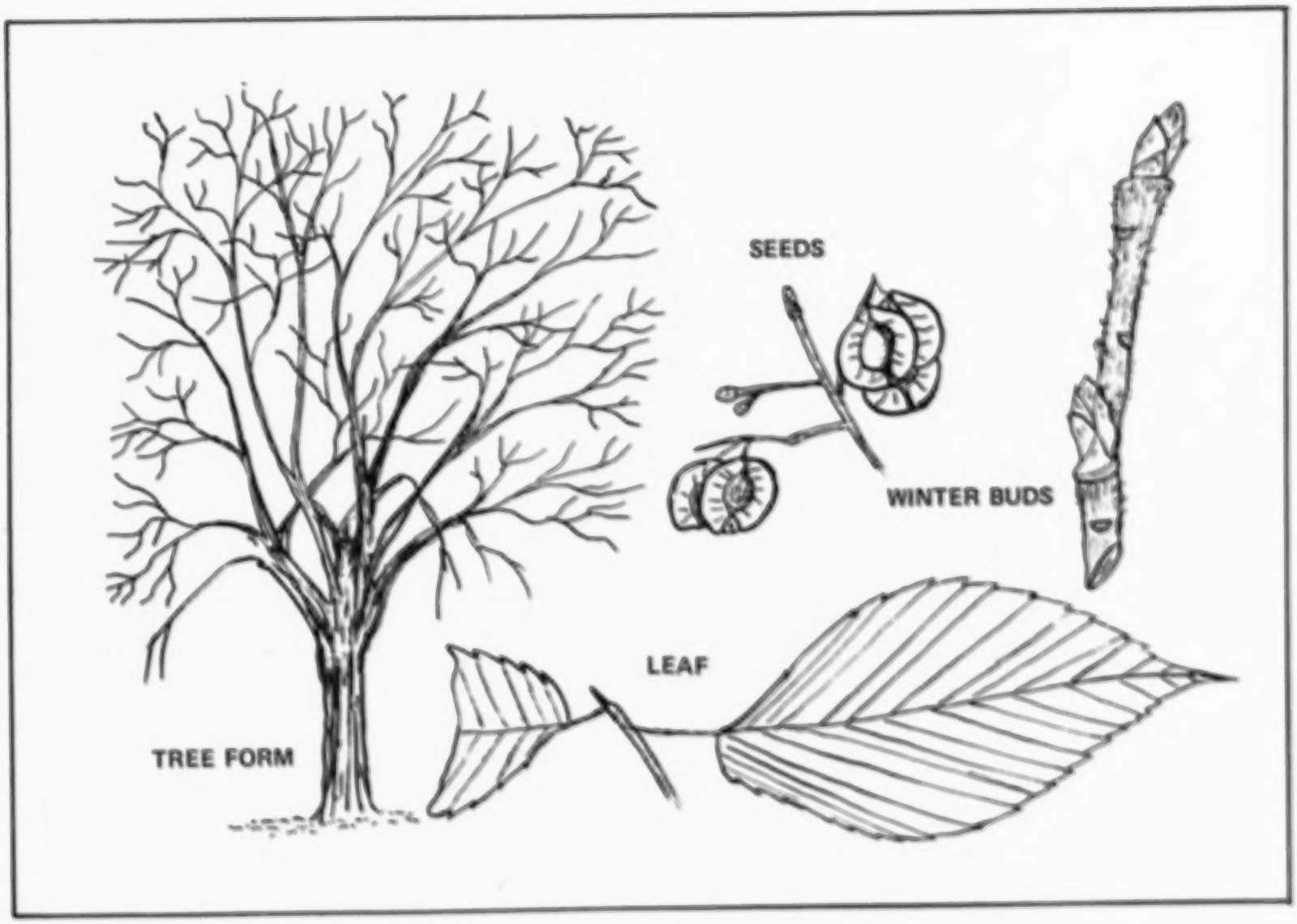
On the first nature trail there are two examples of the China tree, also called the goldrain or varnish tree. This tree, a native of China, was brought to America in 1763 and is sometimes known as the gate tree because early settlers in Indiana planted it at their gates. The China tree does not grow as tall as the tulip tree nor do its branches spread as wide as those of the horse chestnut. It reaches about 30 feet in height.

Its alternate, compound leaves may be 18 inches long with seven to fifteen dark green, saw-toothed leaflets on a stem. The large clusters of yellow flowers blossom in July or August, followed by unusual fruit. The fruit looks like a papery, inflated bladder about two inches long and contains several hard, round seeds. The seeds are red at first and turn a shiny black as they mature. The brown bark is finely furrowed.



4. EUROPEAN WHITE BIRCH (Betula pendula)

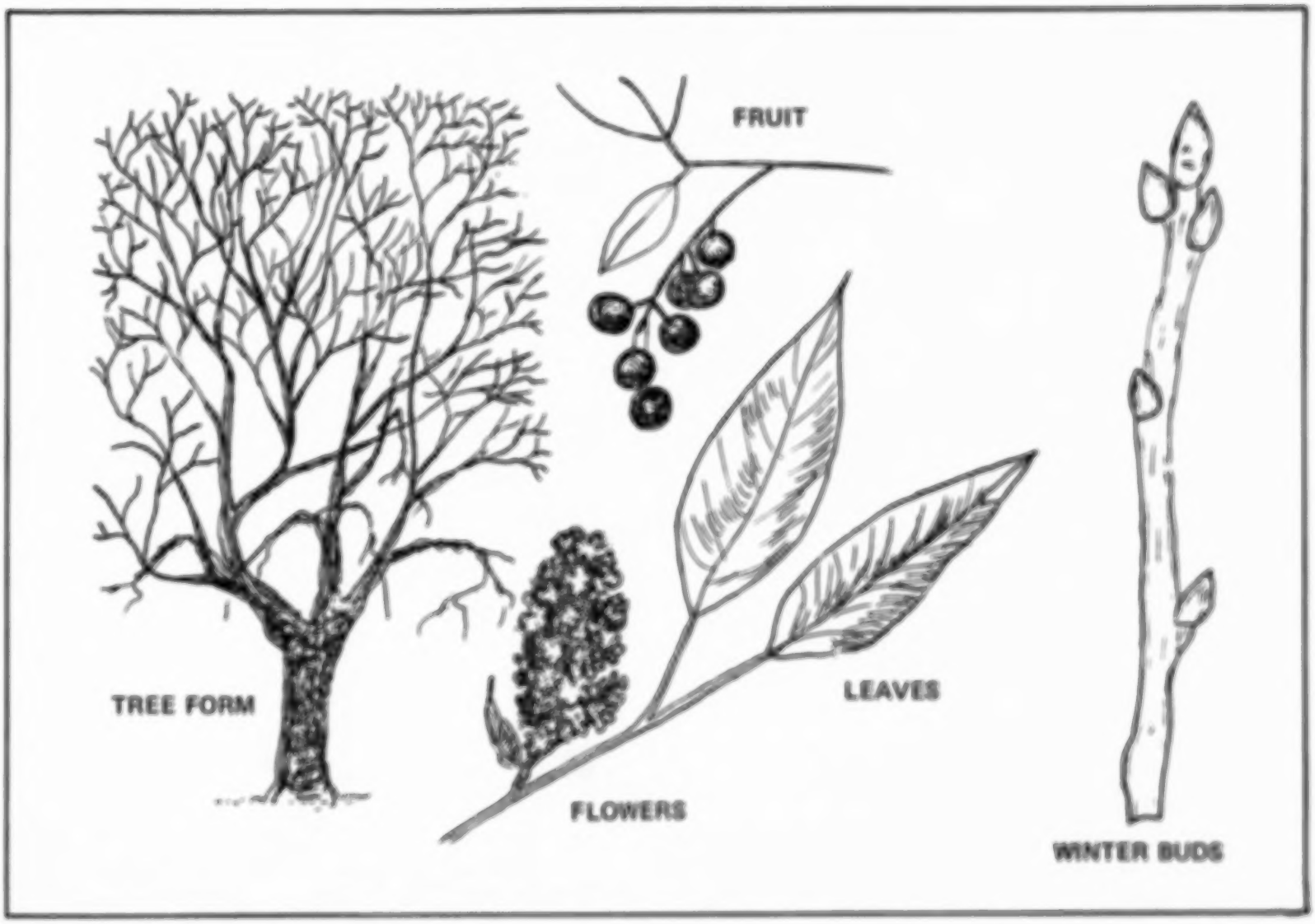
Several kinds of birches grow in the city. Their leaves are roughly triangular in shape with a serrate (saw-toothed) edge. The flowers come out early in the spring. They hang in brownish tassels called catkins. The catkins develop into fruits that may stay on the branches for many months. Some kinds of birches have white bark. One of the prettiest of these, the European white birch, can be seen on the slope at the left of the footbridge. Another kind, our native gray birch (not illustrated in this booklet), grows near the concrete abutment of the Triborough on Nature Trail #2. It is labelled 4A. We can distinguish between the European white birch and the gray birch by observing them carefully. The outer branches of the European white birch droop more than those of the gray birch, and the bark is very white with small black marks. The bark of our native species is somewhat gray with large, sometimes triangular, black markings. The European white birch is not subject to insect attack, one of the reasons it is commonly planted here.



5. SLIPPERY ELM (Ulmus rubra)

The slippery elm is interesting for many reasons. It is related to the American elm, but it does not have the graceful vase shape of the latter. Also, the leaves of the slippery elm have very rough upper surfaces. The inner bark was once used as a medicine. When chewed it becomes slippery, thus giving this elm its name.

Inconspicuous flowers appear in early spring. Later, papery "wafers," each with a little seed enclosed in its center, drop and are blown into small heaps on the ground. The leaf buds start to open before those of other trees and offer the first taste of fresh greenery of the spring to some birds and squirrels. Long ago the Indians used the outer bark of the slippery elm for their canoes. The early settlers made use of the wood for building their houses.

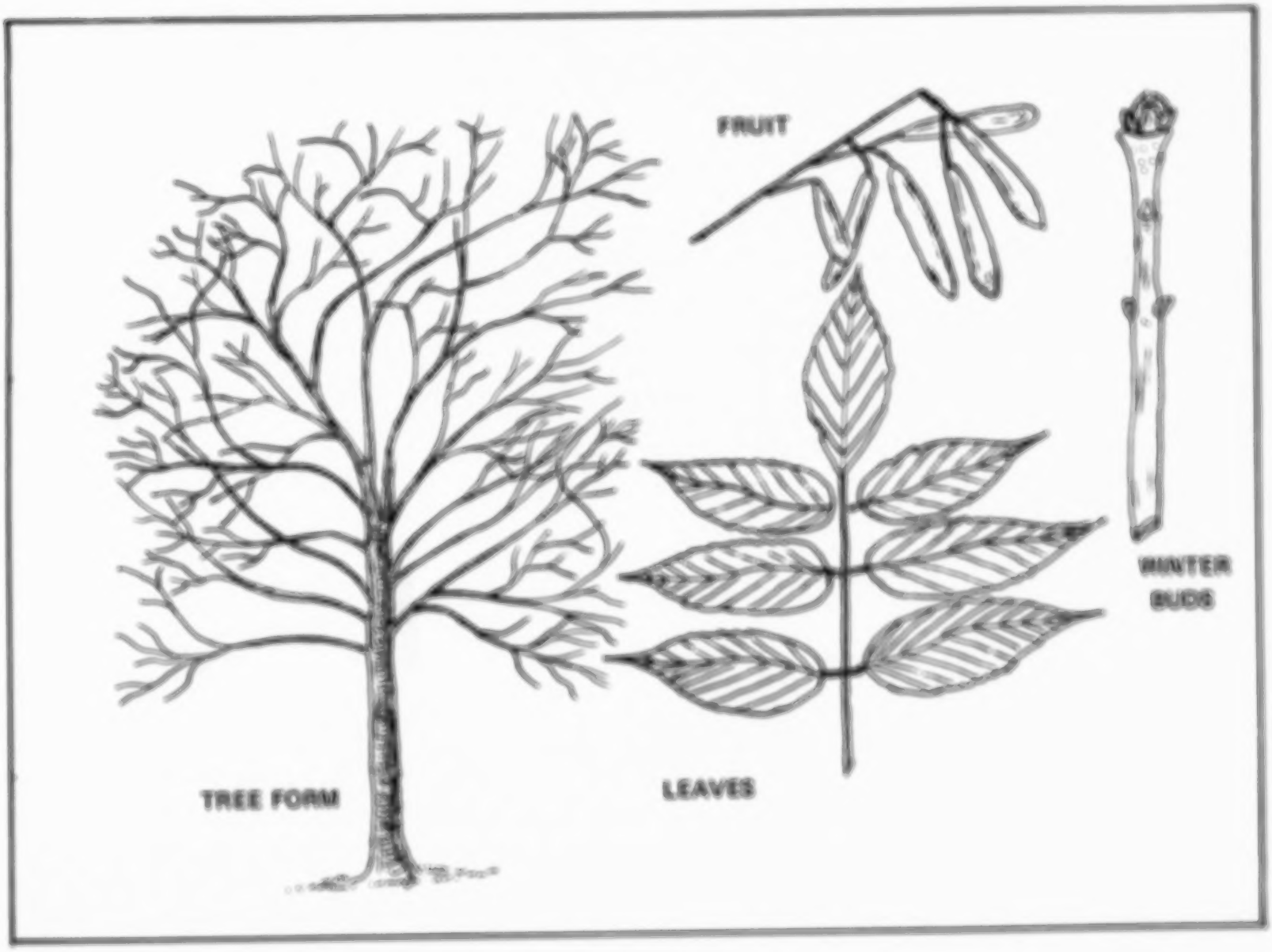


6. WILD BLACK CHERRY (Prunus serotina)

A wild black cherry is among the trees close to the river on Nature Trail #2. The black cherry is one of the largest of our native cherry trees. It grows over a wide range–from Canada to Guatemala and as far west as Minnesota and Texas. In places with deep, rich soil and plenty of moisture, it may live for many years and reach a height of 80 feet. Its leaves are alternate on stems (petioles) which are thin and long, causing the leaves to hang down and appear to droop. The leaves remain a glossy green until late fall when they turn a beautiful maroon before dropping. By examining their edges carefully, we can see the many small serrations or "teeth."

The cherry tree is a lovely sight when its clusters of small, fragrant, white flowers come out in late May or early June. The fruit is a cluster of round red berries which gradually turn black as they ripen. Many kinds of birds and squirrels eat these berries. Insects, especially tent caterpillars, ed on the leaves and may kill the tree if they are not eaten by birds.

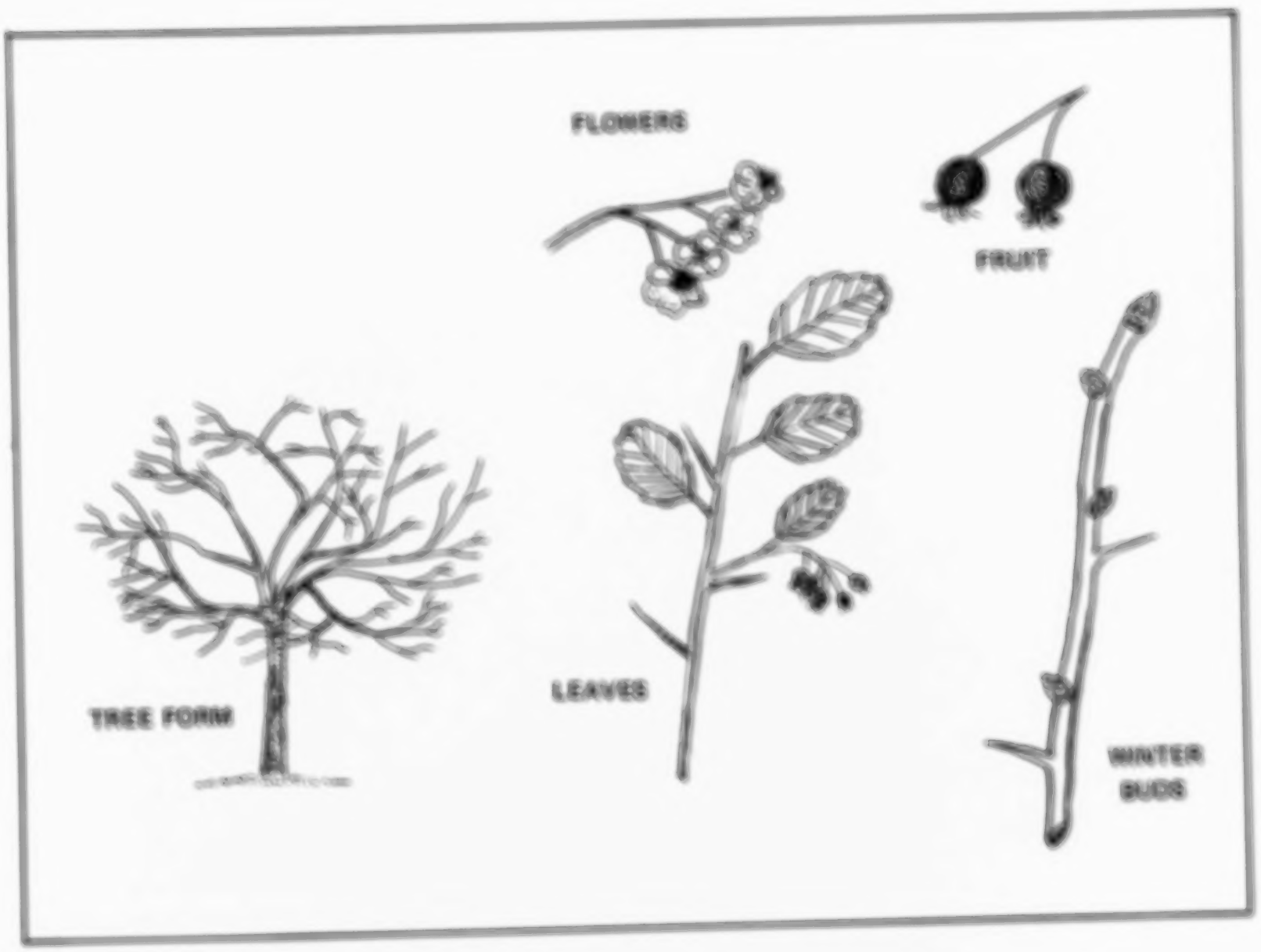
The bark of the young tree is dark brown, smooth, and satiny with horizontal lines in it. As the tree ages, the bark becomes rough with red-brown scales. The wood has a fine grain and is hard; it is frequently used for furniture and fine paneling.



7. WHITE ASH (Fraxinus americana)

The white ash is a large native tree commonly reaching 70 to 80 feet in height. The territory in which it may be found is almost as wide as that of the black cherry. The compound leaves of the white ash are opposite each other. (See illustration of twig.) Each leaf contains five to nine leaflets. The flowers of the white ash are inconspicuous; look for them when they open, before the leaves come out, in April or May. The staminate (male) flowers, which bear the pollen, and the pistillate (female) flowers, which produce the fruit, appear on different trees.

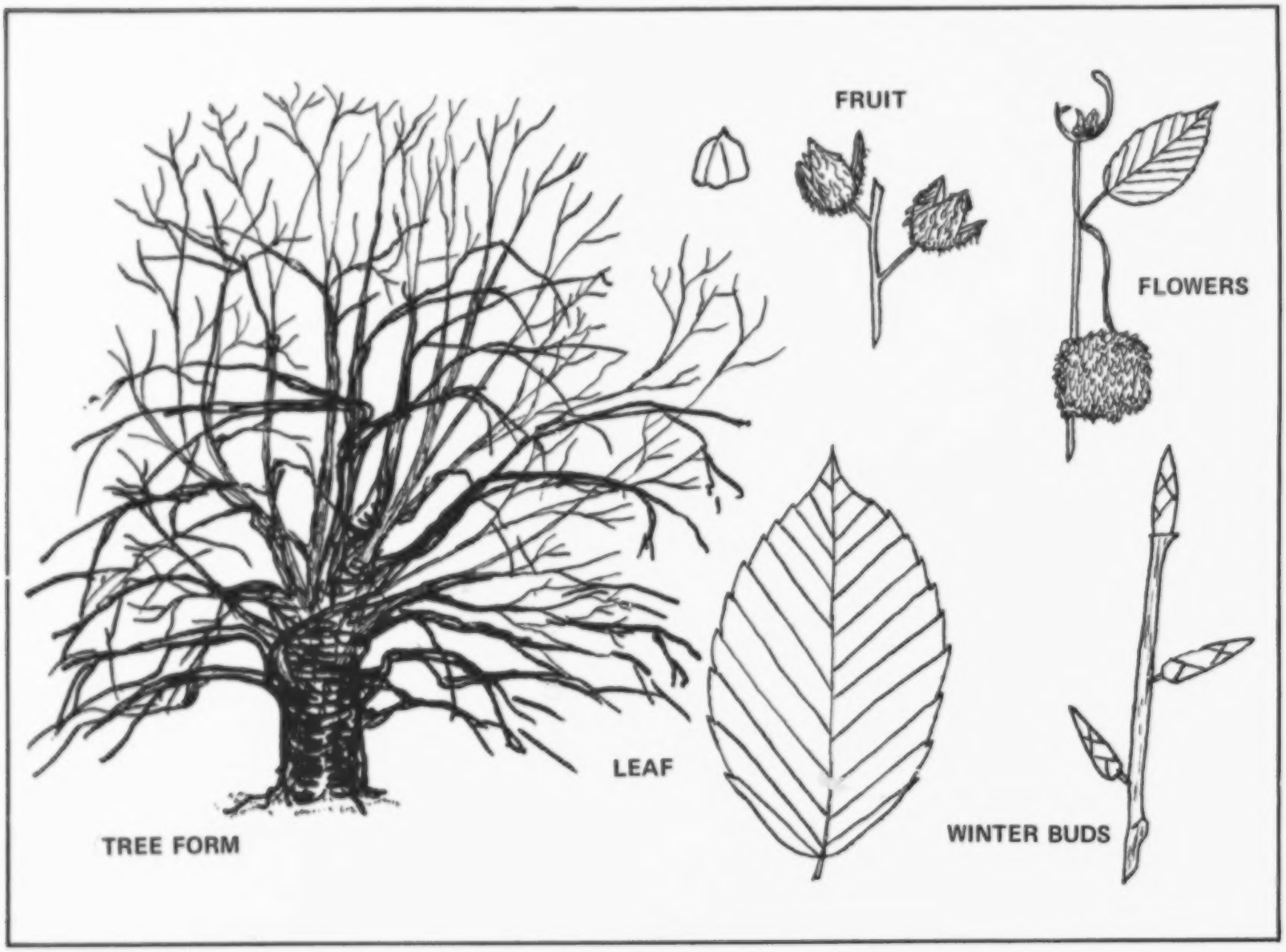
The winged seeds ripen in October or November. When the leaves fall they leave a crescent-shaped scar on the twig. The bark is dark gray with flat furrows in a diamond pattern. The white ash, like many of the oaks, is an important lumber tree. The wood is strong and finely grained and is especially good for making baseball bats.



8. HAWTHORNE (Crataegus)

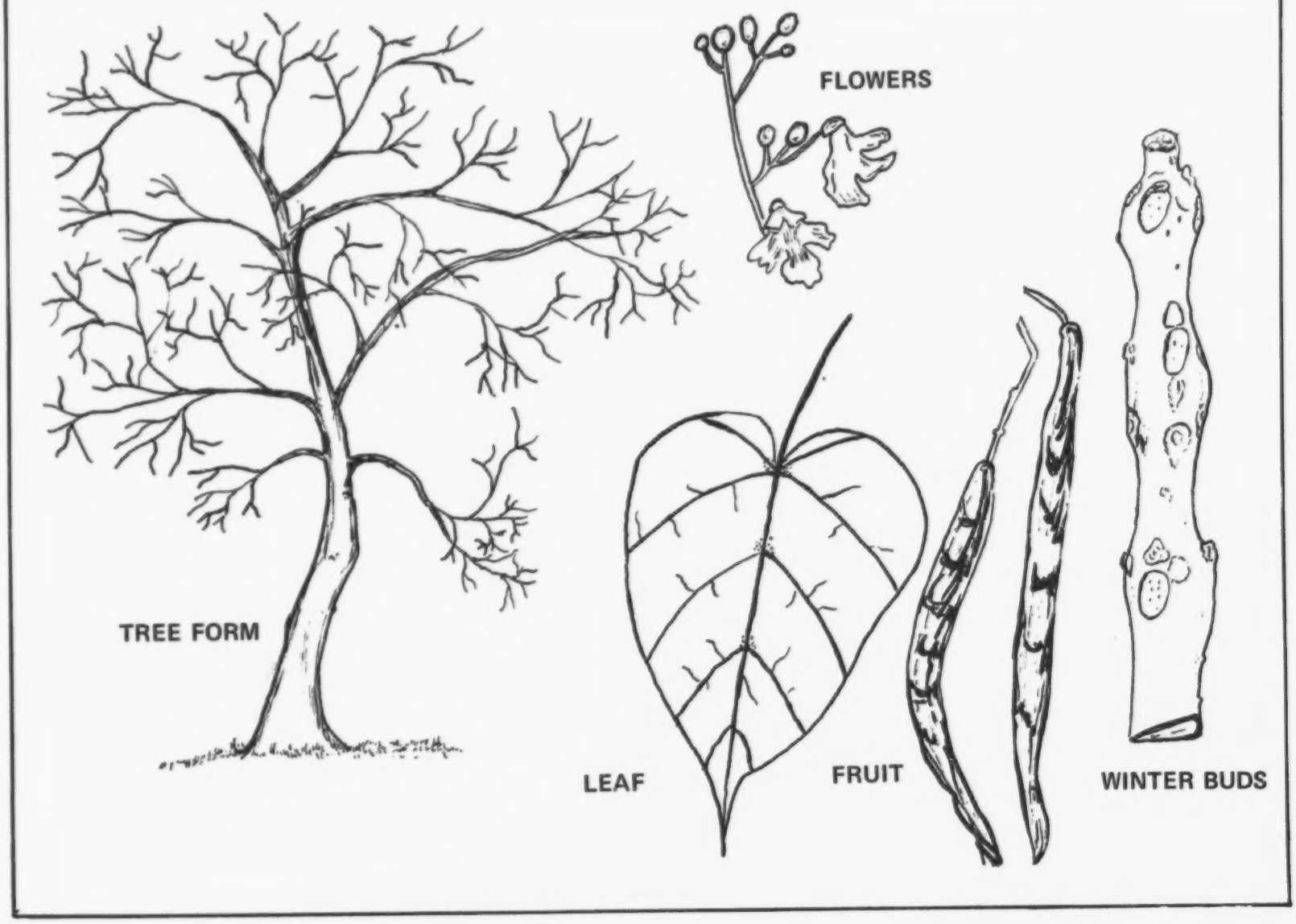
In a far corner of Nature Trail #1, near the fence, is the attractive little hawthorn. There are so many kinds of hawthorns that an entire book could be written about them. Some are native; others have been introduced from Asia and Europe. Their pretty flowers come out in May or June and attract many insects, including pollen-collecting bees.

All hawthorns have single alternate leaves with serrated (toothed) edges. The size and shape of the leaf varies with the species. Hawthorn branches are dense, twisted, and armed with sharp thorns; they provide good protection for birds perching on them. The fruit is an attractive red berry like a tiny apple. We would not like the taste of these berries, but they are excellent food for birds in the winter. The bark of the young tree is usually orange and brown, becoming gray, sometimes scaly, as the tree ages. Hawthorns grow well in New York; many of them are planted to help beautify neighborhoods.



9. COPPER BEECH (Fagus sylvatica astropunicea)

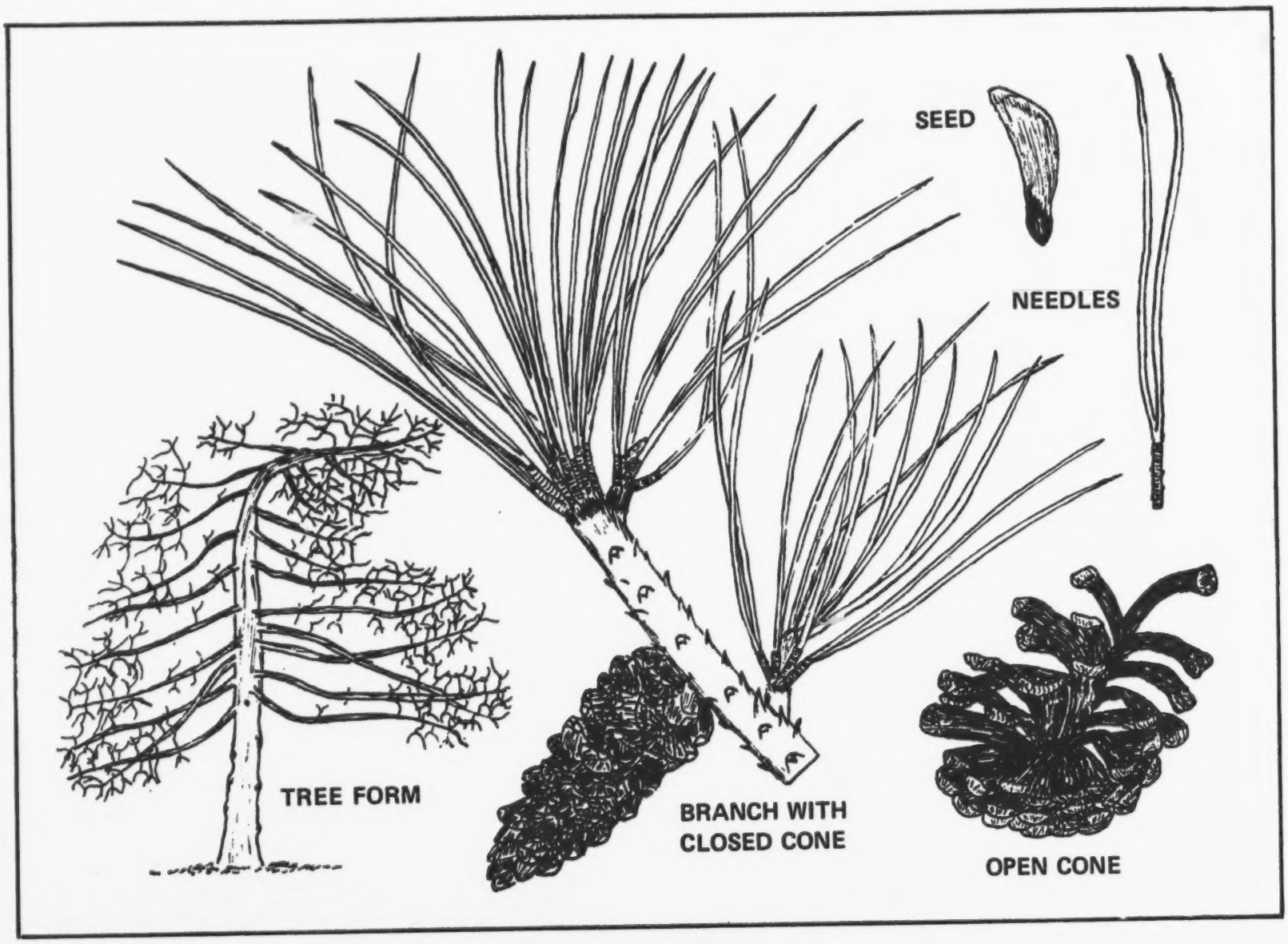
This is a striking tree with dark, reddish-brown leaves and wide-spreading branches. We do not expect to find other plants growing under this tree because it casts such dense shade. Its fibrous roots are near the surface. The leaves contrast with the light gray bark which stays smooth even when the tree grows old. The copper beech is a European tree related to our own American beech, which has silky green leaves. The flowers of the European beech are small and easily overlooked because they come out after the leaves have appeared. Its seed, the beechnut, is triangular and enclosed in prickly burrs.



10. CATALPA (Catalpa bignonioides)

The catalpa tree with its light brown, loose-scaled bark is easily found. Its branches with their distinctive leaves overhang the footbridge as it touches Ward's Island. This tree is also called the Indian bean because the early settlers adopted the Cherokee Indian name for the tree. It is thought to be native to parts of Georgia, Florida, and Mississippi where it grew along the riverbanks. It was introduced into cultivation in 1726 and planted along our eastern seaboard and in Europe. It flourishes as far north as southern New England although the tips of the branches are sometimes killed during cold winters. Although it grows faster than most trees, its wood is not strong and breaks in ice storms. Under favorable conditions it may reach 45 feet in height.

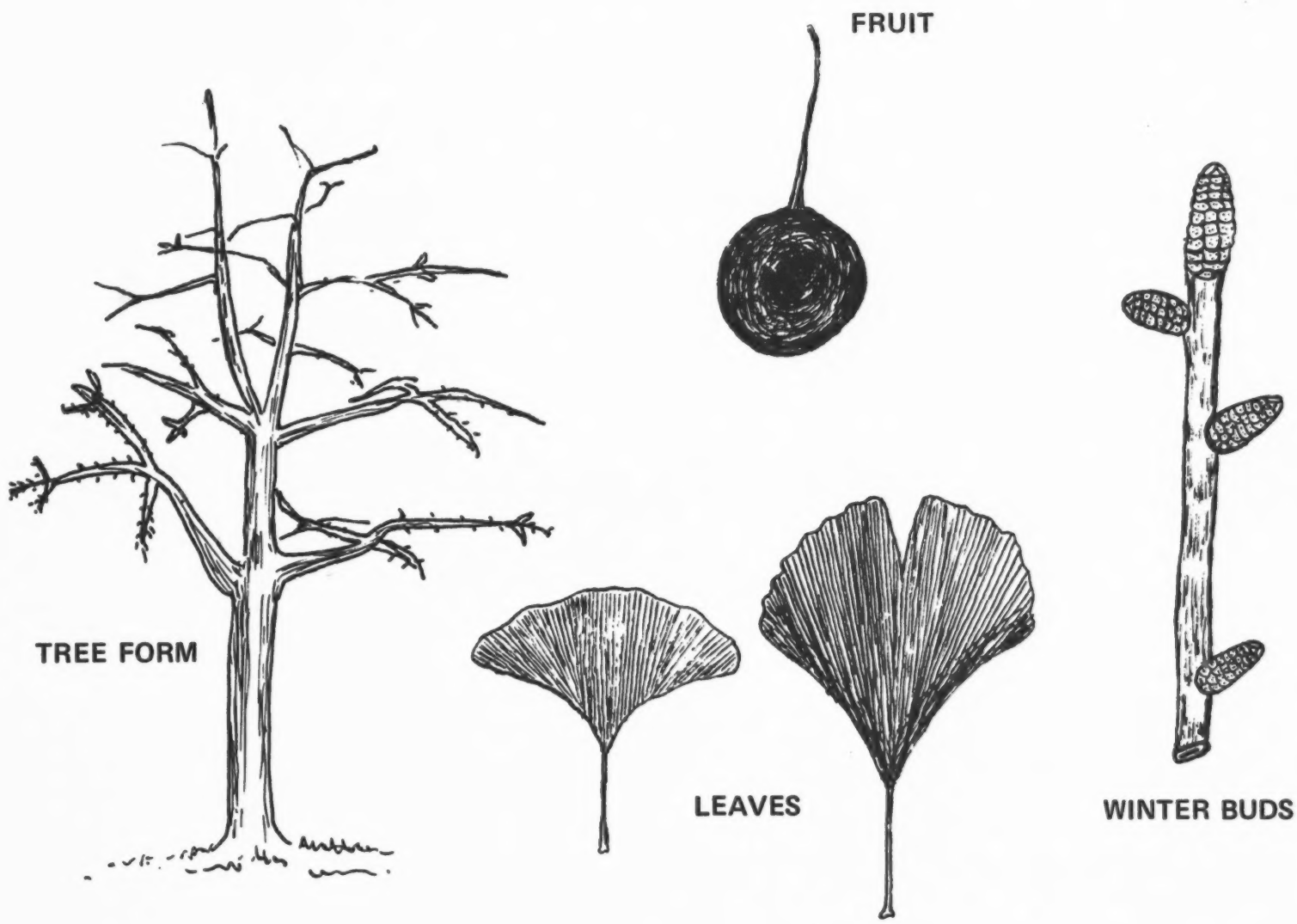
The catalpa is one of the first trees to shed its leaves in the fall and the last to send out new shoots in the spring. Its large, heart-shaped leaves give it a somewhat tropical appearance. They are either set opposite each other or appear in spirals of three around the twig. Large clusters of attractive flowers come out in late June after other species of trees have bloomed. The flowers are white with yellow and purple markings. Some people think they resemble orchids. The fruit is like an elongated stringbean. It is green at first, but later it turns brown and can be shaken to make the seeds rattle inside. Sometimes these seedpods hang on the tree all winter. The winged seeds inside have a fringe of long hairs at each end.



11. AUSTRIAN PINE (Pinus nigra)

The Austrian pine is an attractive evergreen. This pine is native to Europe and Asia Minor and has been cultivated since 1759. It is related to the Japanese black pine. It grows quickly and endures city conditions well. This particular tree is small, but some Austrian pines reach 90 feet in height. What may have caused the unusual shape of this particular tree? The prevailing wind? An injury?

The stiff dark green needles of the Austrian pine are three to five inches long; there are two needles to a bundle. Like all pine trees it has separate pollen cones and seed cones. In early spring the pollen cones of the Austrian pine look like little candles at the tips of the branches. The yellow pollen they produce is blown by the wind to the still inconspicuous seed cones which then develop into cones two to three inches long. When the scales of the cones open, we can see the seeds, each enclosed in the base of a papery wing. Because of these wings, the seeds can be blown great distances. In winter when food is scarce, hungry animals sometimes gnaw the cones to uncover and eat seeds. Young branches of the Austrian pine are yellowish brown, but the trunk and the older branches have heavy dark brown bark.

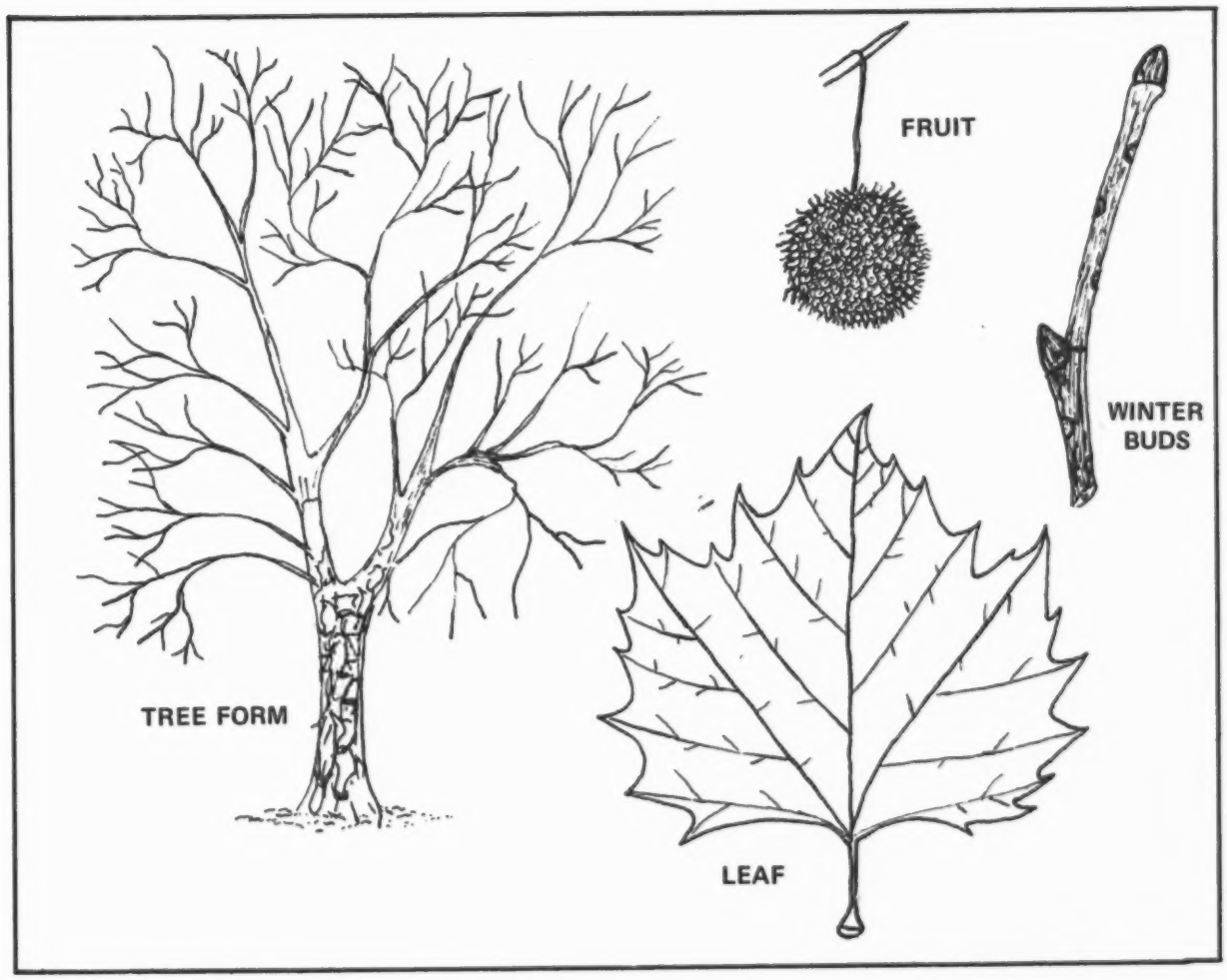


12. GINGKO (Gingko biloba)

On the plateau just behind the semicircle of benches, there is an interesting collection of trees, one of which is the gingko. The gingko is a truly unique tree. It is the only member of its family. Fossil records tell us that gingkos grew in this country when dinosaurs lived here. Glaciers destroyed our gingko forest, but the species survived in China. Some trees from China were taken to Japan where priests cultivated them. In 1784, gingko trees were brought over here to grow again.

The shape of a gingko is distinctive. It has few big branches which grow more or less upright, sometimes making sharp angles. The small branches curve down and have many short, thick, stubby spurs. The fan-shaped leaves are like no others. Three to five leaves grow alternately along either side of each spur. The bark is brown with curving ridges. These ridges become more pronounced as the tree ages.

Gingko trees produce either pollen or seeds. As in some other species, we speak of male and female gingko trees. The seed has a bad-smelling, bitter pulp which encloses a sweet edible kernel. Although they are not good shade trees, gingko trees are widely planted in cities. They are disease resistant, seldom attacked by insects, able to withstand drought after they are established, and are not damaged by soot and gases in the air.



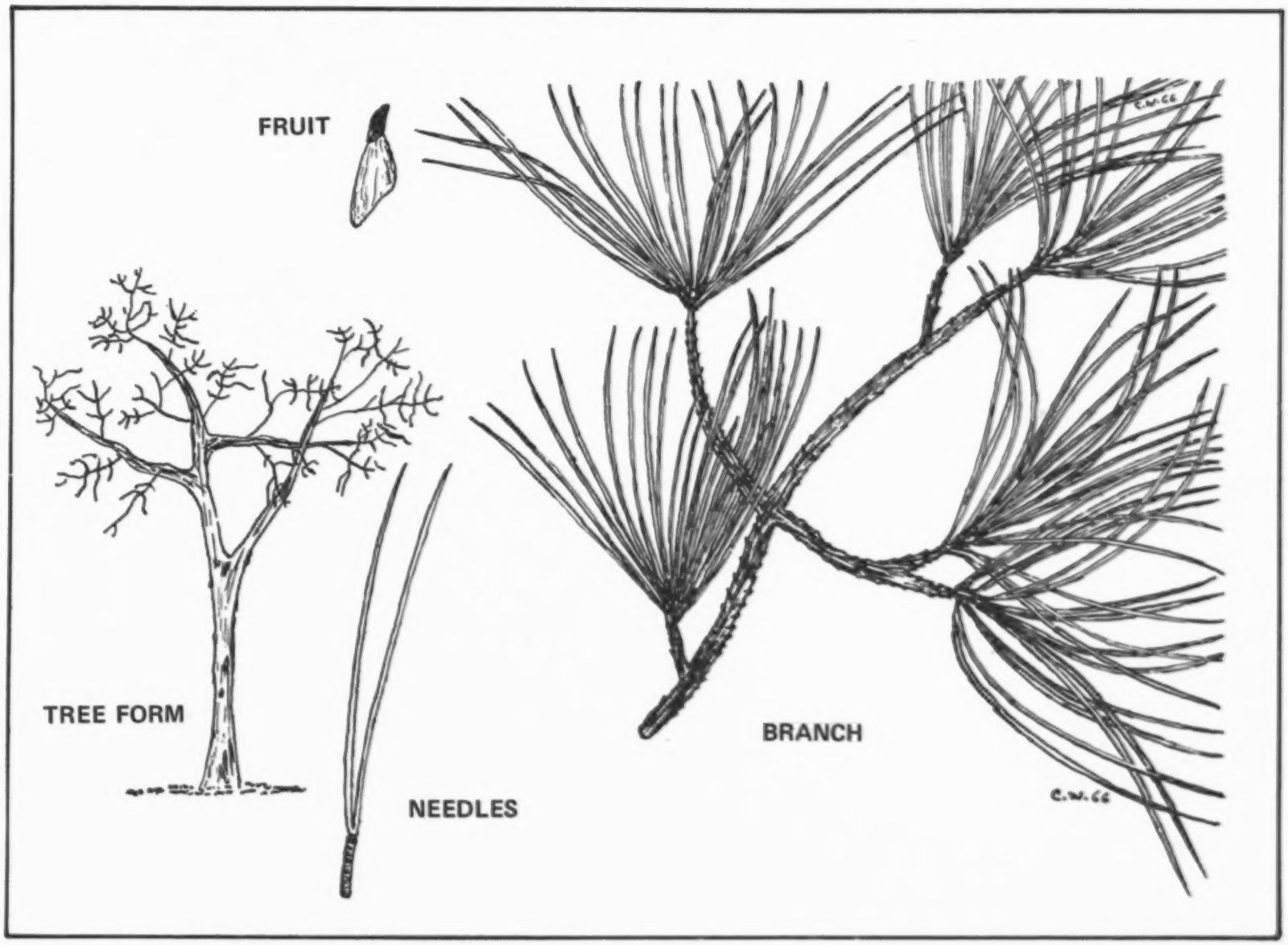
13. SYCAMORE (Platanus occidentalis)

There are many kinds of plane trees, three of which grow here. All have broad leaves and cast deep shade. Also, all have round heads of fruit packed with seeds that children call "itchy balls."

One of these three species of plane tree is native here. Its scientific name is *Platanus occidentalis.* It is also called sycamore, buttonwood, buttonball, or American plane tree. It is one of the giant trees of our native forests, but it is rarely seen in the city because it is subject to a twig blight that kills it. We can recognize the sycamore by the very light green and cream colored patches on its bark and by its fruit heads, or buttonballs, which often dangle from the branches, *one* on each stalk, all winter.

The plane tree usually planted on city streets and in parks is *Platanus acerfolia*, the London plane tree, a hybrid. A hybrid is the offspring of two different kinds of plants or animals. In the case of the London plane tree, the parent trees are the *Platanus orientalis* and the *Platanus occidentalis.* Pollen from a tree of one of these kinds was transferred to the pistil of a tree of the other kind. As its scientific name *(Platanus acerfolia)* suggests, the London plane tree has a similarity to the maple *(acer)*; its leaves resemble maple leaves. This hybrid has proved to be more resistant to disease than either of its parents.

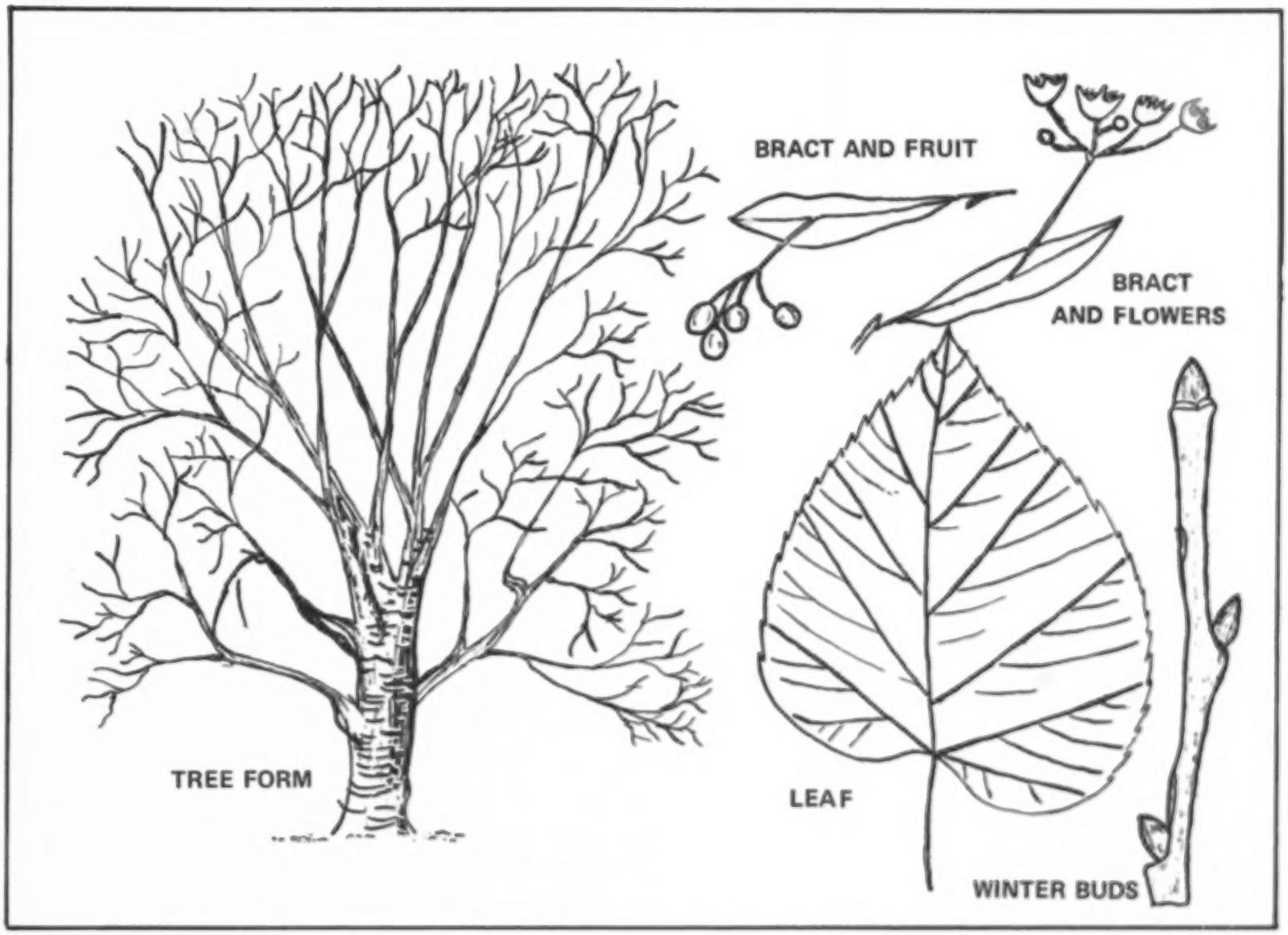
Unlike the maple, the leaves of the plane tree are alternate rather than opposite. The outer bark of the London plane tree comes off in large flakes, exposing a lighter colored inner bark which is covered with fine brown hairs during its young growth. It usually has *two* fruit heads.



14. JAPANESE BLACK PINE (Pinus thunbergii)

The oddly shaped little Japanese black pine tree on Nature Trail #1 is bound to attract attention. If conditions are right, the Japanese black pine grows almost as tall as its relative, the Austrian pine which it closely resembles. It was introduced to cultivation in 1855 from the coastal regions of Japan. Gardeners there have grown it for centuries, but rather than allowing it to grow to its full height, they often train it in dwarf size and interesting shapes for their dish gardens.

The needles of the Japanese pine also come in bundles of two, but they are very dark green and stiffer than those of the Austrian pine. The bark of the trunk is very dark, almost black; that of the branchlets is yellow-orange. The white, cylindrical buds are not resinous. The cones are 1 1/2 to 2 1/2 inches long, and grow on short stalks.

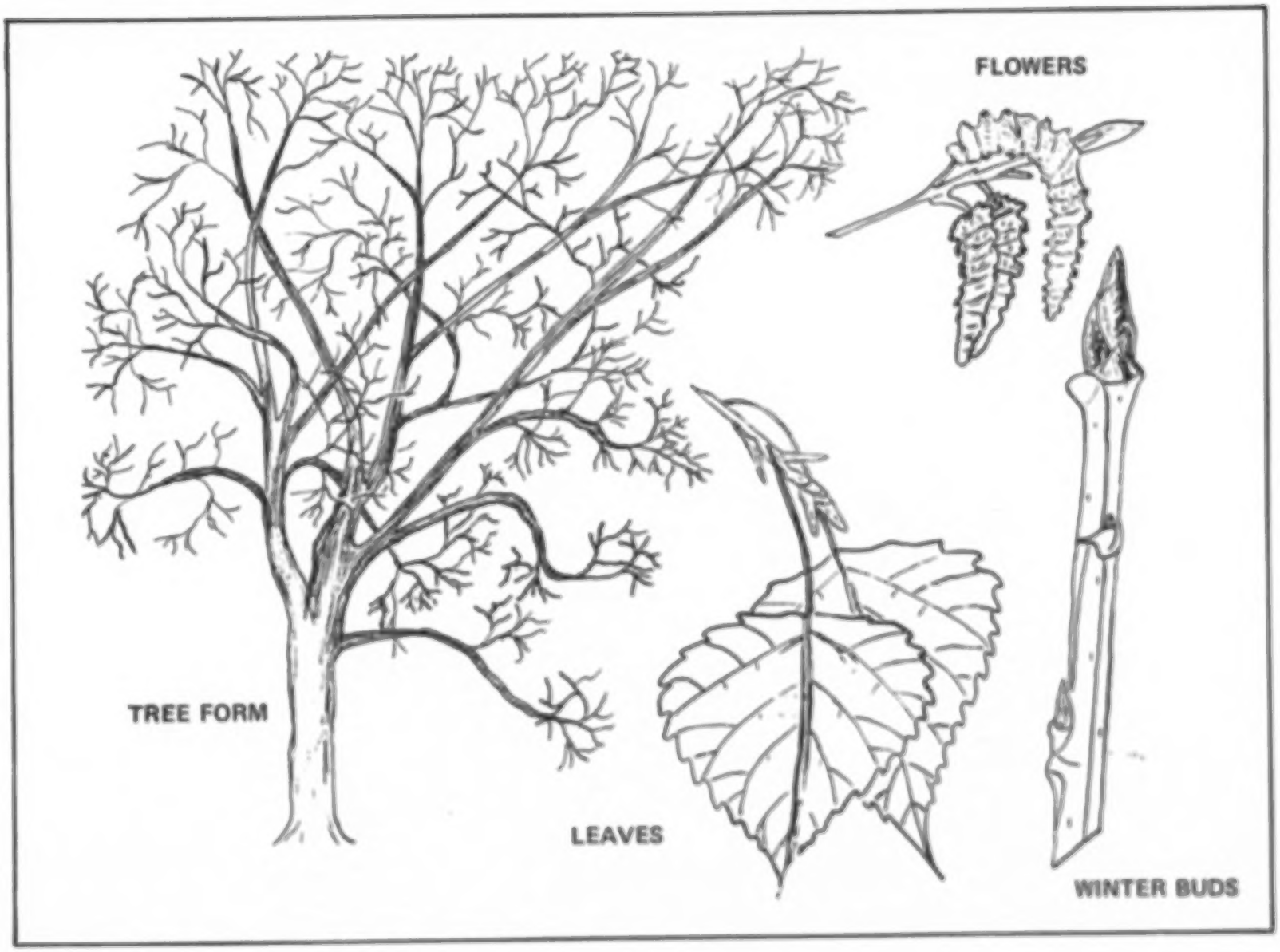


15. LINDEN or BASSWOOD (Tilia americana)

Near the water's edge on Nature Trail #1 the linden or basswood is found. It is one of the largest forest trees of the eastern United States, growing from southern Maine to the mountains west of the Dakotas. The linden is an excellent shade tree that can withstand city conditions and is sometimes planted on our streets. It grows best in rich, moist soil where it often reaches 100 feet in height.

The long-stemmed leaves are alternate. They are heart-shaped, with uneven sides, and toothed edges. The veins stand out sharply, but the leaves are smooth on both the top and undersurfaces. While the tree is young, the bark is smooth and gray; as the tree ages, the bark becomes furrowed. The wood of the linden is light in color and in weight. It is easily sawed and shaped, and therefore often used for veneers and boxes.

In May and June after the leaves of the linden have opened, hanging clusters of white, sweet-smelling flowers appear. Many insects are attracted by their nectar, and the hum of their movements is audible from a distance of several feet. The fruit develops during July and August, held by a special hanging leaf called a bract. These fruits, which look like peas, are gray and hard. Sometimes they hang on the tree until late winter. Birds do not like them, but squirrels do.

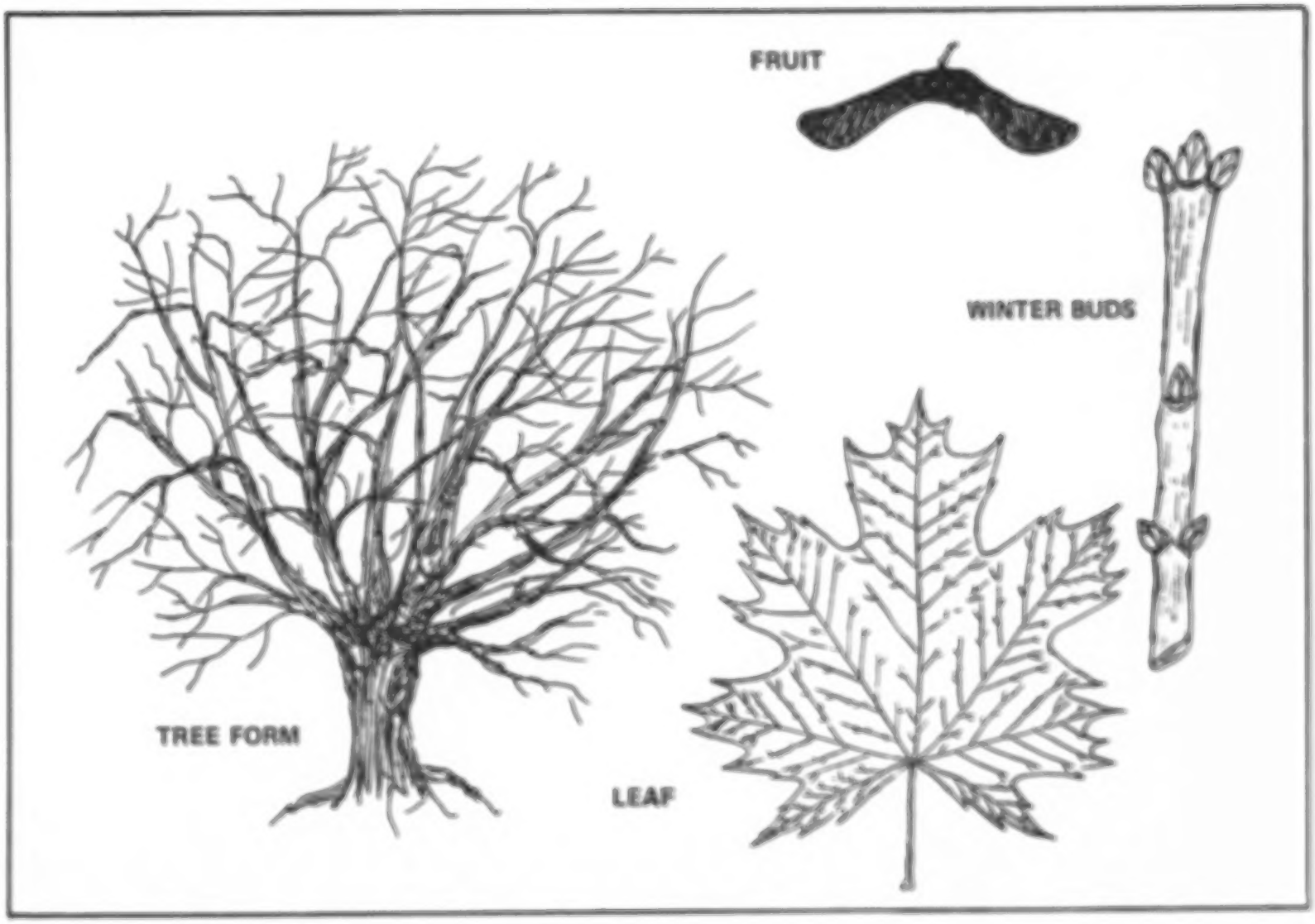


16. EASTERN COTTONWOOD (Populus deltoides)

The eastern cottonwood, one of the larger poplars, grows in the area extending from New York to Florida, and west into Texas and the Dakotas. Under favorable conditions it may reach 100 feet in the East; in the West it has reached 130 feet. It is a shallow-rooted, moisture-loving tree unsuited to planting in streets because its roots push up sidewalks and clog drainpipes.

The leaves are triangular, glossy, and leathery, with big, rounded teeth. Their long, flattened stems are very flexible, making it possible for the leaves to dance in the lightest breeze. The long catkins of either staminate or pistillate flowers appear on separate trees in early spring before the leaves do. The fluffy catkins of the pistillate flowers give the tree its name. The tiny seeds are attached to cottony fibers and may be blown far away by the wind. Birds sometimes use the fibers to line their nests.

The bark of a young cottonwood tree is smooth and light green in color. On older trees it is dark gray or brown with many ridges. This tree grows very rapidly when it is young. The wood is not strong, and the brittle twigs and branches are often broken by heavy winds.



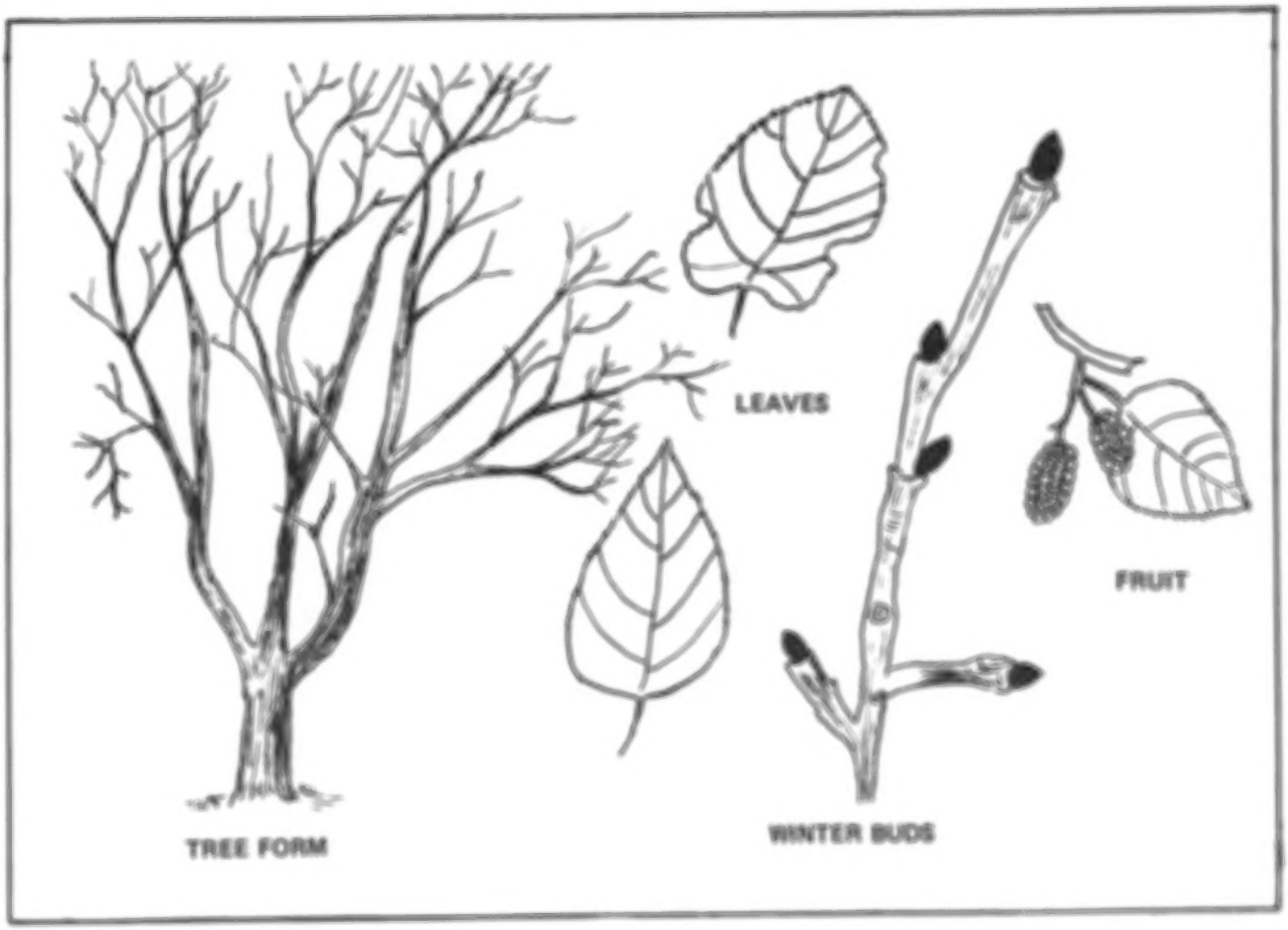
17. NORWAY MAPLE (Acer platanoides)

There are about 115 different kinds of maple trees growing in North America, Asia, Europe, and North Africa. Some are native to our country; others have been introduced here from across the ocean. All of them are planted for their beautiful foliage. Maples have simple opposite leaves and fruits with two long, flat wings.

The Norway maple is one of several kinds of maple found on Ward's Island. This tree is a native of Europe but has been cultivated here since early colonial days. It grows more rapidly and does better in the city than our native sugar maple. The Norway maple can be distinguished from other maples by its large reddish buds.

Beautiful, greenish flowers, arranged in umbrella-shaped clusters, are conspicuous in April, before the leaves appear. As the flowers open, they expose their yellow pollen and also appear to be yellow.

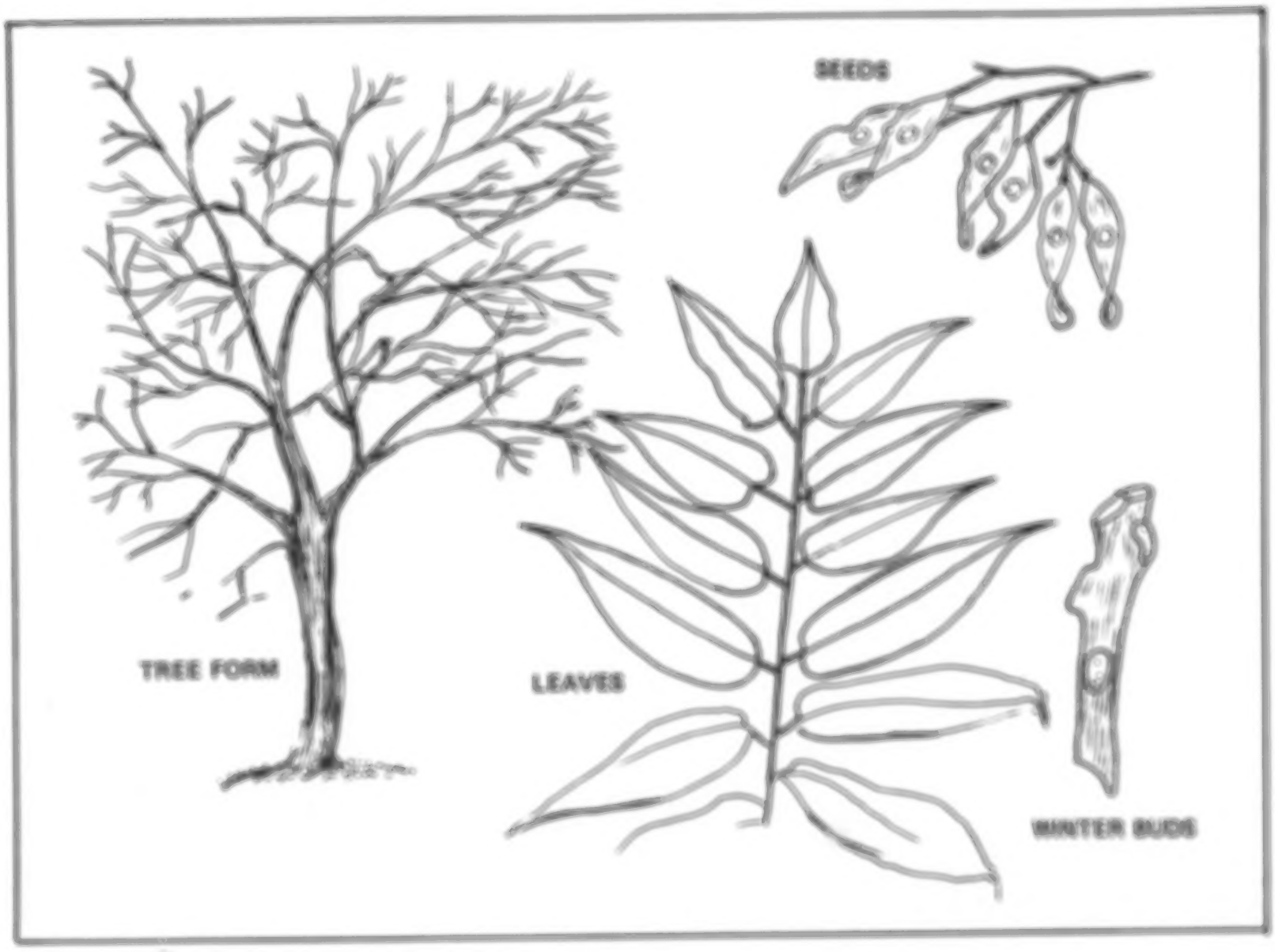
The leaves, like those of all maples, grow opposite each other on the branches. They are green and shiny beneath. The twigs and branches also grow opposite each other. Examining the arrangement of the leaves, we notice that each pair crosses the next pair. If one pair faces east-west, the next pair faces north-south. This arrangement of the leaves, and their size, account for the dense shade of this tree. The leaves turn bright yellow in the fall. The winged seeds of the Norway maple are spread at a wide angle while those of other maples are set at a sharper angle.



18. WHITE MULBERRY (Morus alba)

The white mulberry is one of the most interesting trees on the nature trails. It never grows very tall; 45 feet is its maximal height. The smooth, shiny, bright green leaves are alternate, and are toothed. They vary so much in outline that it is possible to find as many as five differently shaped leaves on one branch. The bark is brown and scaly.

The flowers are inconspicuous catkins which appear at the same time as the leaves. The fruit is a white or pink-lavender berry, a favorite food of birds; its leaves are the only food of the silkworm. The early colonists imported this tree from China in an attempt to start a silk industry here. The tree took root, although the silk industry did not. As a result, however, the white mulberry is more common than our native red mulberry in some Atlantic states.



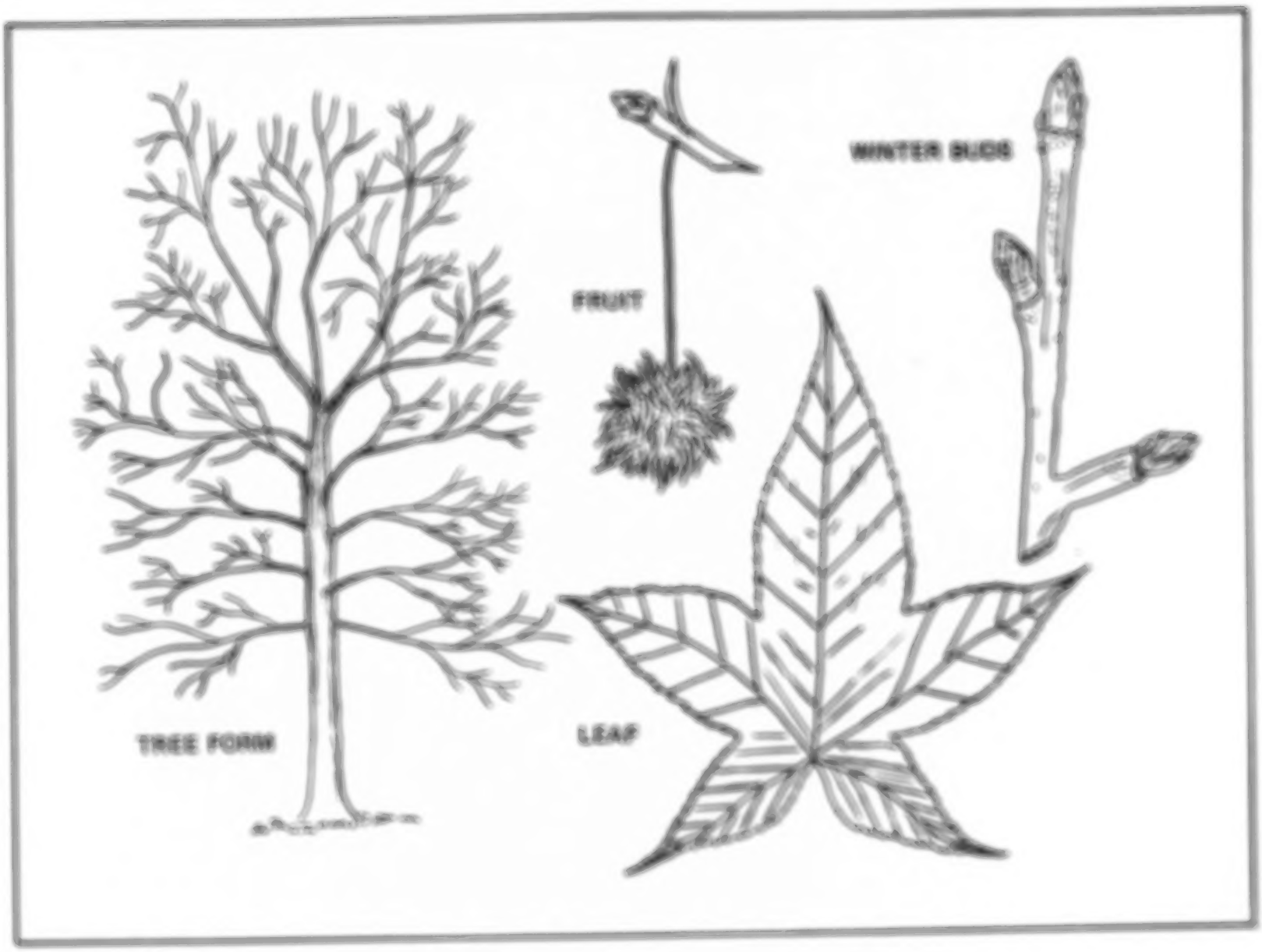
19. AILANTHUS (*Ailanthus glandulosa*)

The ailanthus, sometimes called the tree of heaven, is found near the end of Nature Trail #1. This hardy tree can withstand drought and the dust and gases in the city air. It grows in almost any kind of soil, in sun or shade, even through a cracked sidewalk. The ailanthus was first brought to the United States from China in 1784. A mature tree may reach 60 feet with wide-spreading branches.

The bark is grayish brown, quite smooth in young trees, with light vertical lines and characteristic rough, roundish lenticels (pores for the exchange of gases between the atmosphere and the plant cell). After the leaves drop in the fall the ailanthus can be recognized by the horseshoe-shaped leaf scars on its thick branches. The leaves are alternate and compound with 13 to 41 leaflets. There are a few blunt lobes at the base of each leaflet. While the number of leaflets vary, there is always an odd number of them. The leaves are very large and look like huge ferns against the sky.

Ailanthus trees are either male or female. The staminate flowers of the male tree have an unpleasant aroma. The pistillate flowers of the female tree develop into conspicuous clusters of winged fruit or samara. These samaras may be blown great distances by the wind.

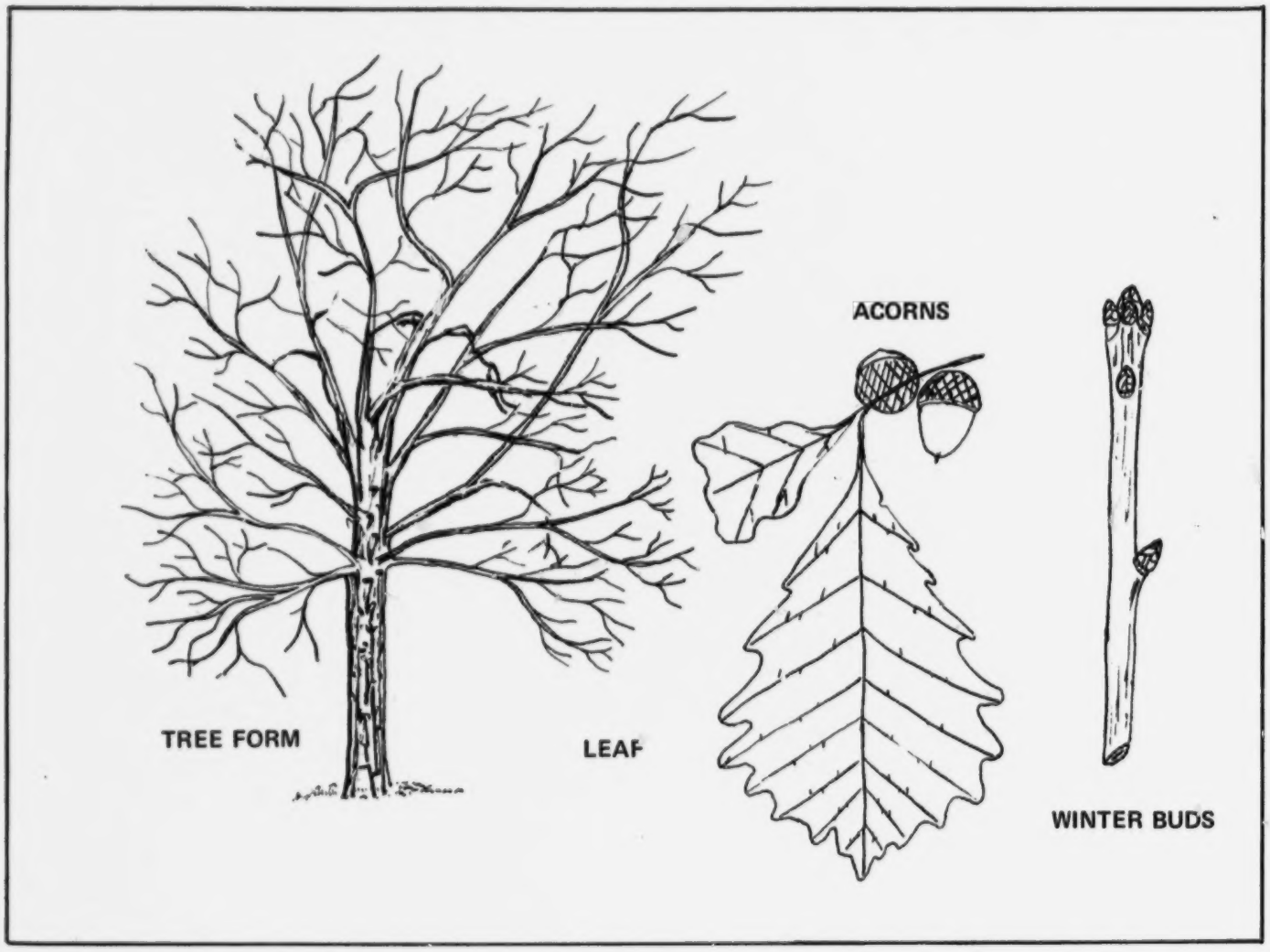
The ailanthus has become famous as "the tree that grows in Brooklyn" and may also be the tree that grows in your backyard.



28. SWEET GUM (Liquidambar styraciflua)

A sweet gum tree is found near the path at the end of the plateau. This tree often grows over 100 feet tall and is native to forests from Connecticut to Florida, as well as in Missouri and Mexico. This species has been cultivated since 1681. It is a handsome, straight, well-balanced tree with beautiful autumn foliage. The bark is dark and rough, often developing corklike ridges especially on the twigs. The leaves resemble those of a maple tree but can be distinguished by their five to seven sharp points. If we stand beneath a sweet gum and look up, the leaves on their long thin stems look like stars in the sky. During the summer they are dark green and quite shiny. In the autumn they turn a beautiful crimson.

The flowers of the sweet gum tree are not conspicuous but the fruit is very distinctive. It is a horned, prickly ball over an inch wide that hangs one to a stem. There are holes between the horns through which the seeds fall out when the winter winds shake the dangling balls, unless hungry birds have eaten the seeds before then.



21. SWAMP WHITE OAK (Quercus bicolor)

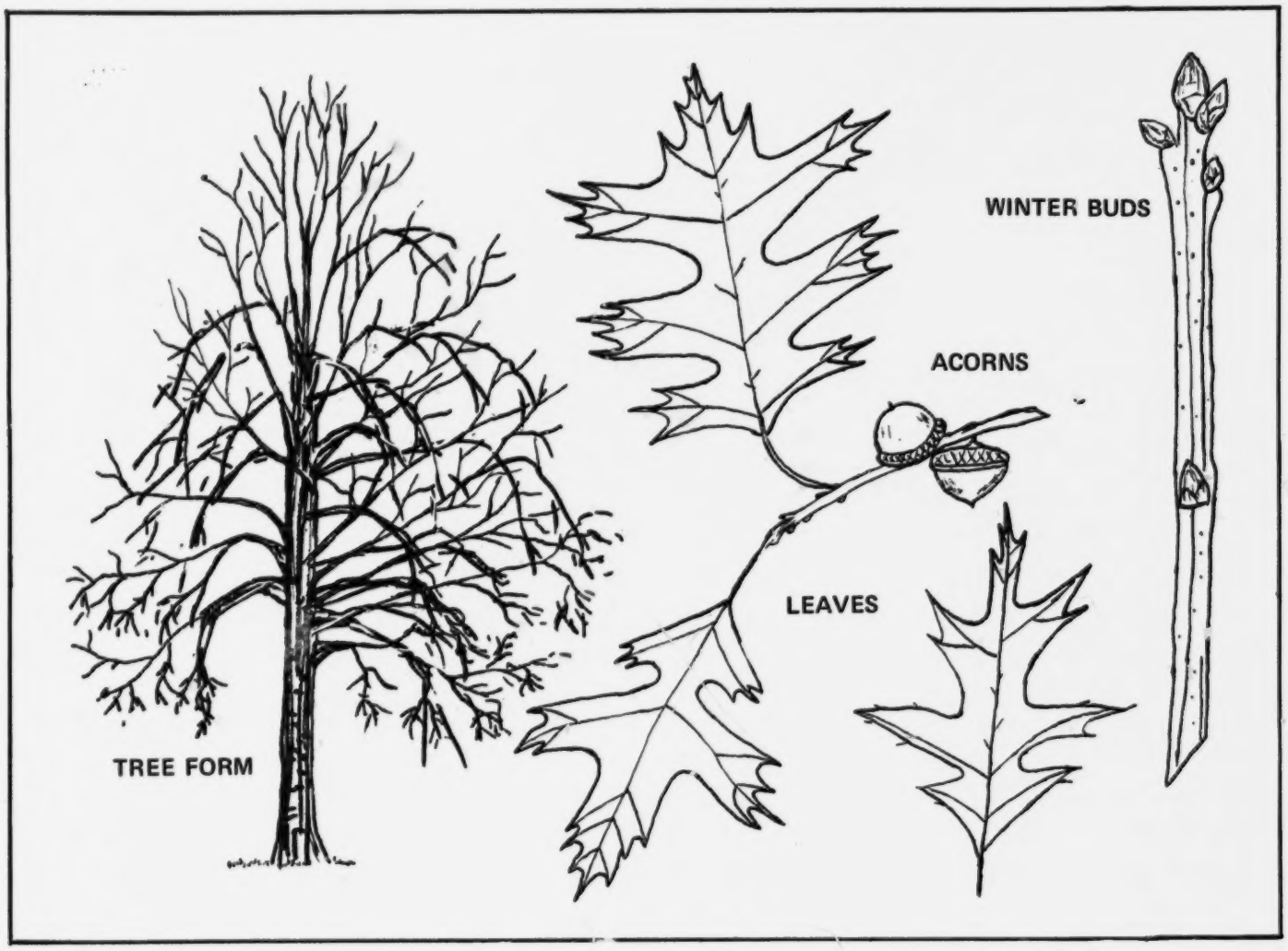
Quercus, the scientific name for oak trees, is an ancient Latin word that means beautiful tree. There are more than 200 different species of oak trees growing in the temperate zone of the northern hemisphere and in the mountains of the southern hemisphere. They all have alternate leaves, and their fruit is the acorn.

There are two main *groups* of oaks: white oaks and black oaks. Leaves of the white oaks generally are lobed or edged with blunt teeth, and their acorns ripen the first year. Black oaks have leaf lobes with bristle tips, and it takes two years for their acorns to ripen.

Near the fence at the end of Nature Trail #1 we find a shaggy little tree that is not growing well. It is a swamp white oak. As we might guess from its name, it grows best in wet places. It is native from Quebec south to Georgia and west to Michigan and Arkansas. It reaches a height of 90 feet in low, swampy places. The bark is gray-brown with long, shaggy scales. The branches grow at awkward angles. The lower ones die but seldom drop off, adding to the ragged appearance of the tree. The alternate leaves are about four to six inches long, with wavy, round-toothed edges.

Oak trees have separate staminate and pistillate flowers which blossom on the same tree in early spring. The staminate flowers are in long tassels; the pistillate flowers are small spikes that develop into acorns after pollen from the staminate flowers has been deposited on them. The acorns of the swamp white oak are large, one or two on a stalk. Each acorn is set in a cup which extends one-third of the way up the acorn's sides. It is hard for us to find these acorns because birds and squirrels often find them first.

(2)



22. PIN OAK (Quercus palustris)

A pin oak grows near the water fountain on Nature Trail #1. It belongs to the same genus *(Quercus)* as the swamp white oak, but it is of a different species *(palustris)* and belongs to the group of black oaks. This symmetrical tree has slender spreading branches that usually droop at the ends. It got its name because of its small twigs which are like pins. They were sometimes used as nails for fastening wood in colonial days. Early settlers found the pin oak growing from Massachusetts to Delaware, and as far west as Arkansas. They started to cultivate it before 1770. As a young tree it grows quickly and does well in the city, so it is frequently planted along our streets. In a forest it may reach a height of 100 feet or more.

The alternate leaves of the pin oak are 3 to 4 1/2 inches long with five to seven deeply cut, pointed, or bristly lobes. (Compare these with the swamp white oak leaves, which are rounded.) The leaves turn red-brown in the autumn and often stay on the tree late into the winter. The flowers resemble those of the swamp white oak. The acorns are small, measuring about a half-inch across, and take two years to develop. About one-third of the acorn is embedded in its flat cup.

TREES FOUND ON NATURE TRAIL #2*

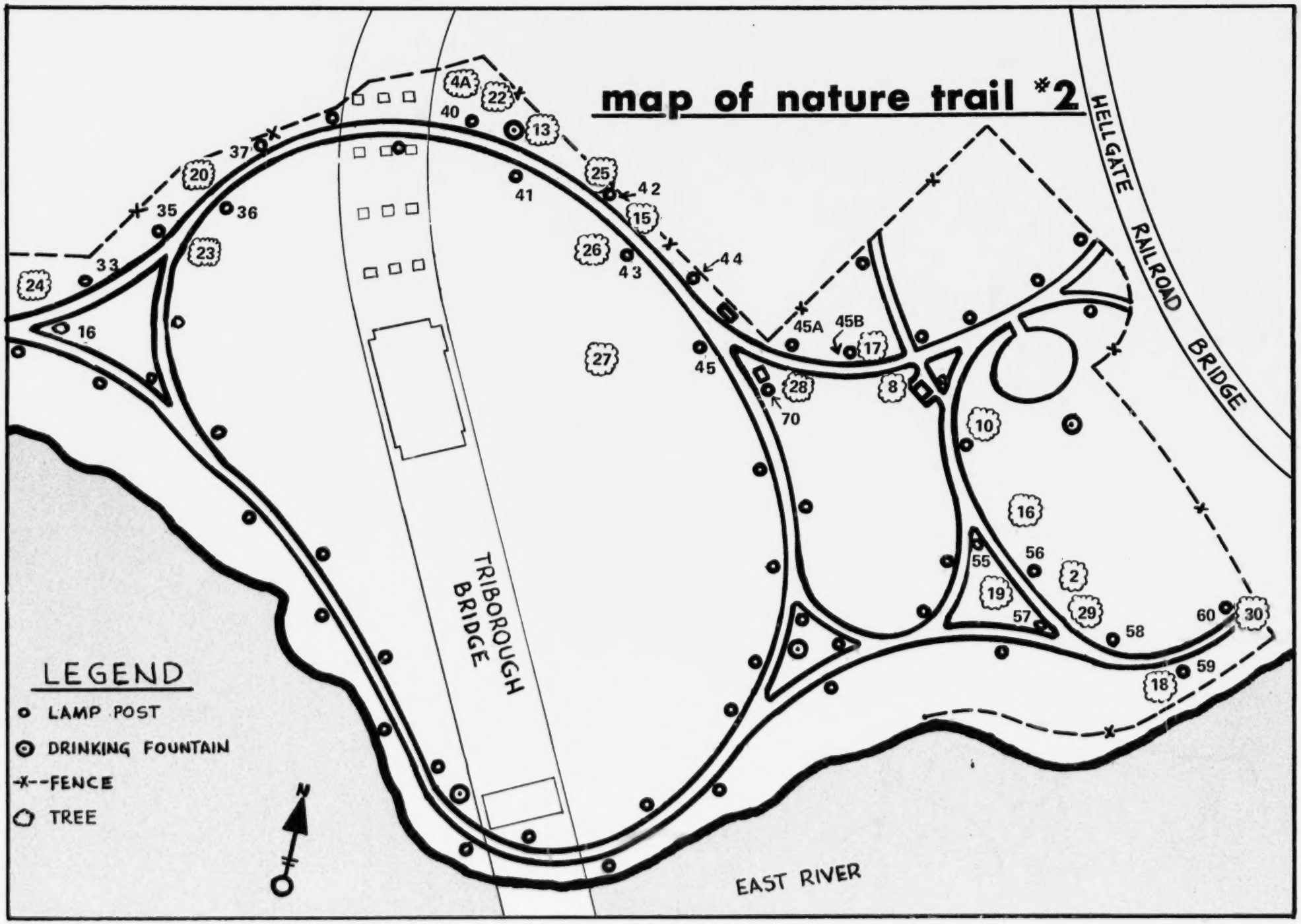
23. WILLOW (Hybrid)
24. WEEPING WILLOW
25. SILVER MAPLE
26. SCARLET OAK
27. BLACK LOCUST
28. SYCAMORE MAPLE
29. NORTHERN RED OAK
30. AMERICAN ELM
2. HORSE CHESTNUT
4A. GRAY BIRCH
8. HAWTHORN
10. CATALPA
13. SYCAMORE
15. LINDEN
16. EASTERN COTTONWOOD
17. NORWAY MAPLE
18. WHITE MULBERRY
19. AILANTHUS
20. SWEET GUM
22. PIN OAK

The number preceding the name of each tree listed above corresponds with the number of that tree on the map facing this page. Nature Trail #2 guides you to eight trees, numbered 23 to 30, not found on Nature Trail #1. Descriptions and illustrations of these seven trees are found on the pages that follow.

Nature Trail #2 includes trees also seen on Trail #1. Descriptions of these trees are found in the preceding section. As you walk along Trail #2 do not expect the numbers to follow each other in order. For example, after passing the hybrid willow (23) you will see the sweet gum (20) across the road; then the gray birch (4A); then the sycamore (13), and so on.

The lampposts are numbered and are also indicated on the map. They serve as location points for the Park Department and are helpful in identifying nearby trees.

*Nature Trail #2 begins just past the fork in the road behind the baseball fields. It includes the low hill, the picnic area, and the playground area, and continues to the end of Ward's Island.


map of nature trail *2
HELLGATE RAILROAD BRIDGE
TRIBOROUGH BRIDGE
EAST RIVER
LEGEND
LAMP POST
DRINKING FOUNTAIN
FENCE
TREE
N
4A
22
40
13
37
20
35
36
41
25
42
15
23
26
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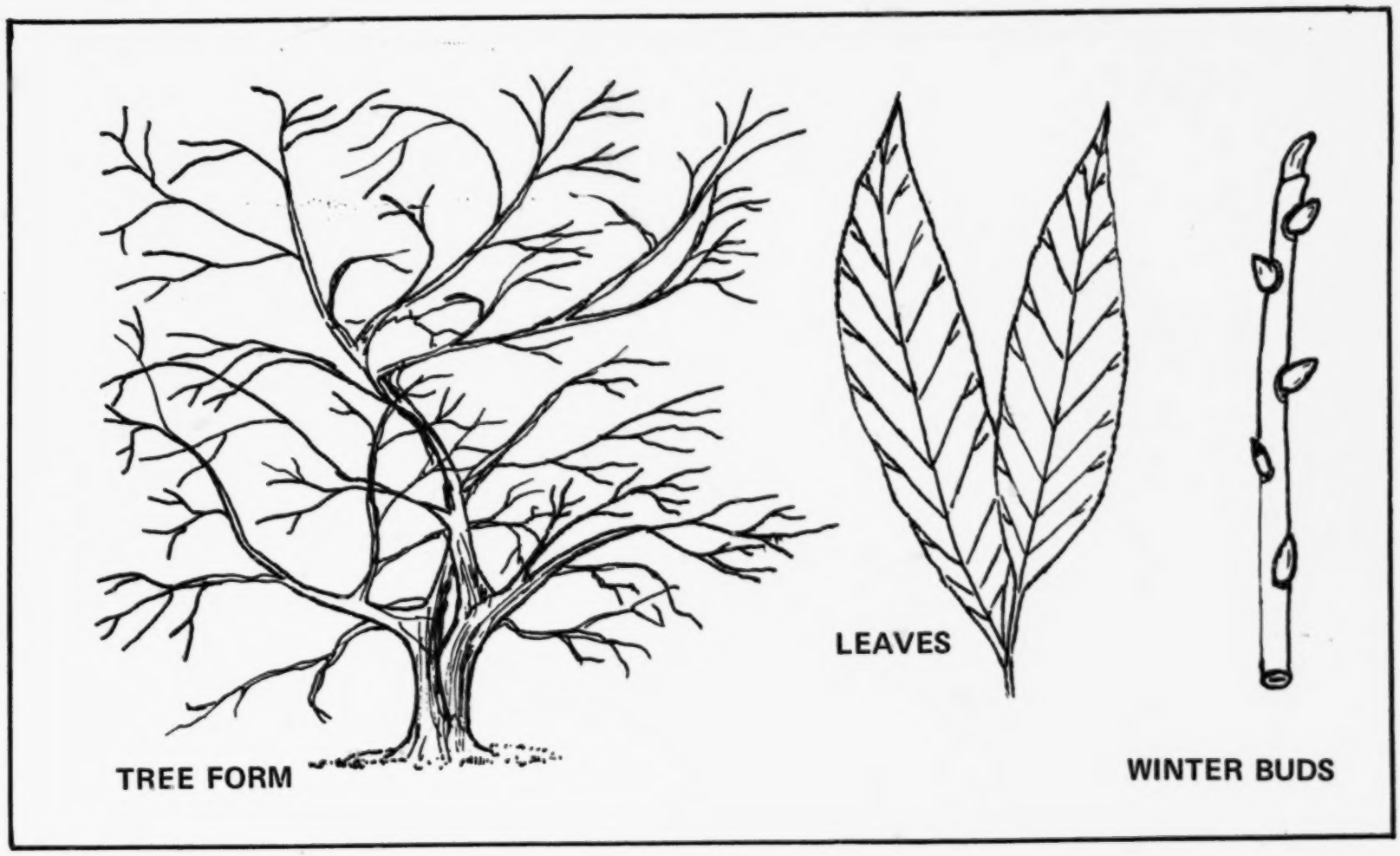
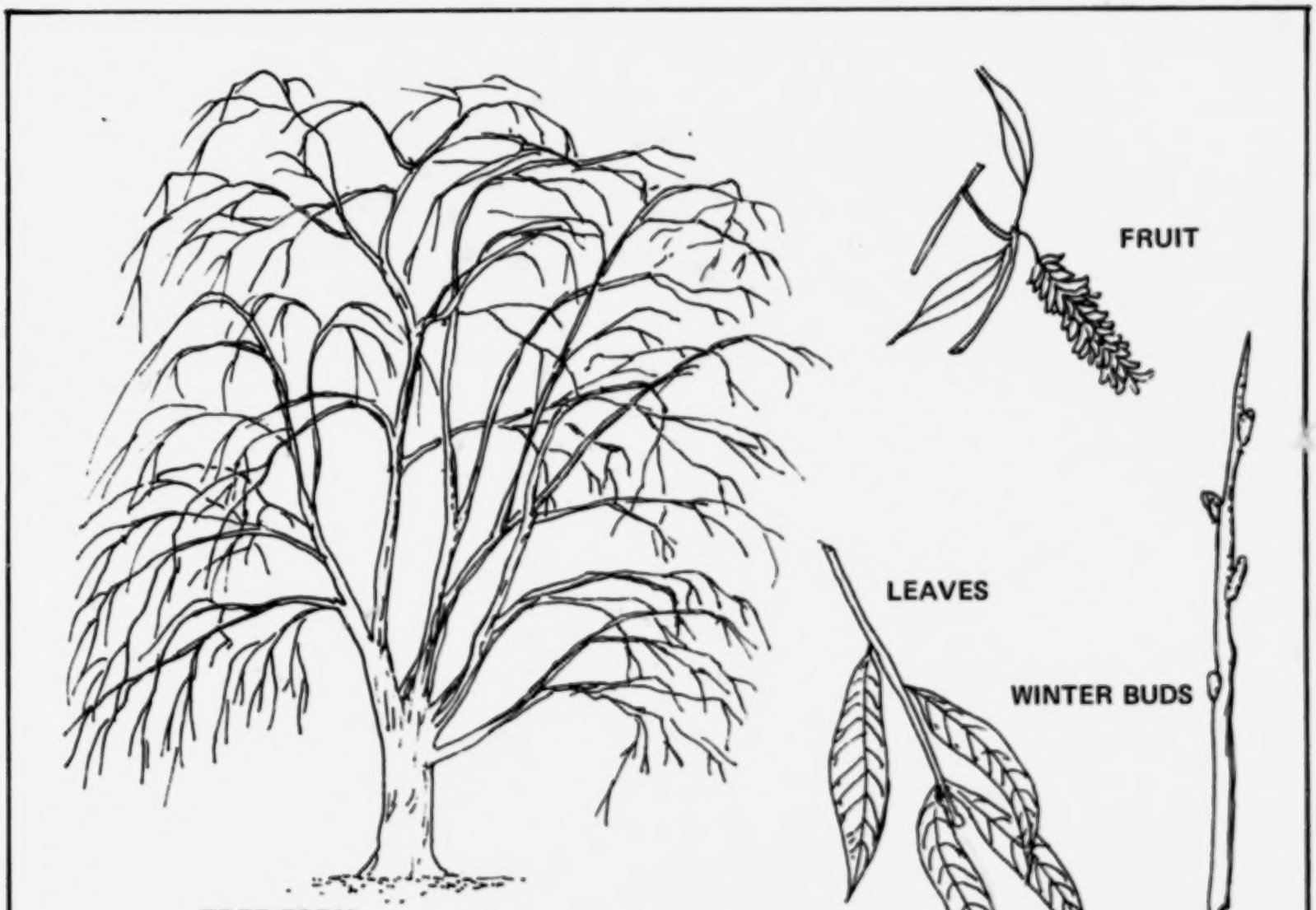


23. WILLOW (Salix)

There are many kinds of willows. Illustrated here is one of the willows on Ward's Island. It is a hybrid; that is, a cross between two kinds of willows: the crack willow and the white willow. As a result, this willow has some characteristics of each of its parents. Like the crack willow, its twigs and branches are brittle, and like the white willow, it has a heavy trunk with branches near the ground.

Willows grow easily where the soil is moist. A willow twig placed in wet ground will soon sprout roots and start growing into a new tree.

Willows are fine trees for parks, but they are not good street trees because their twigs and small branches break off easily, leaving the surrounding area untidy and sometimes damaging property.

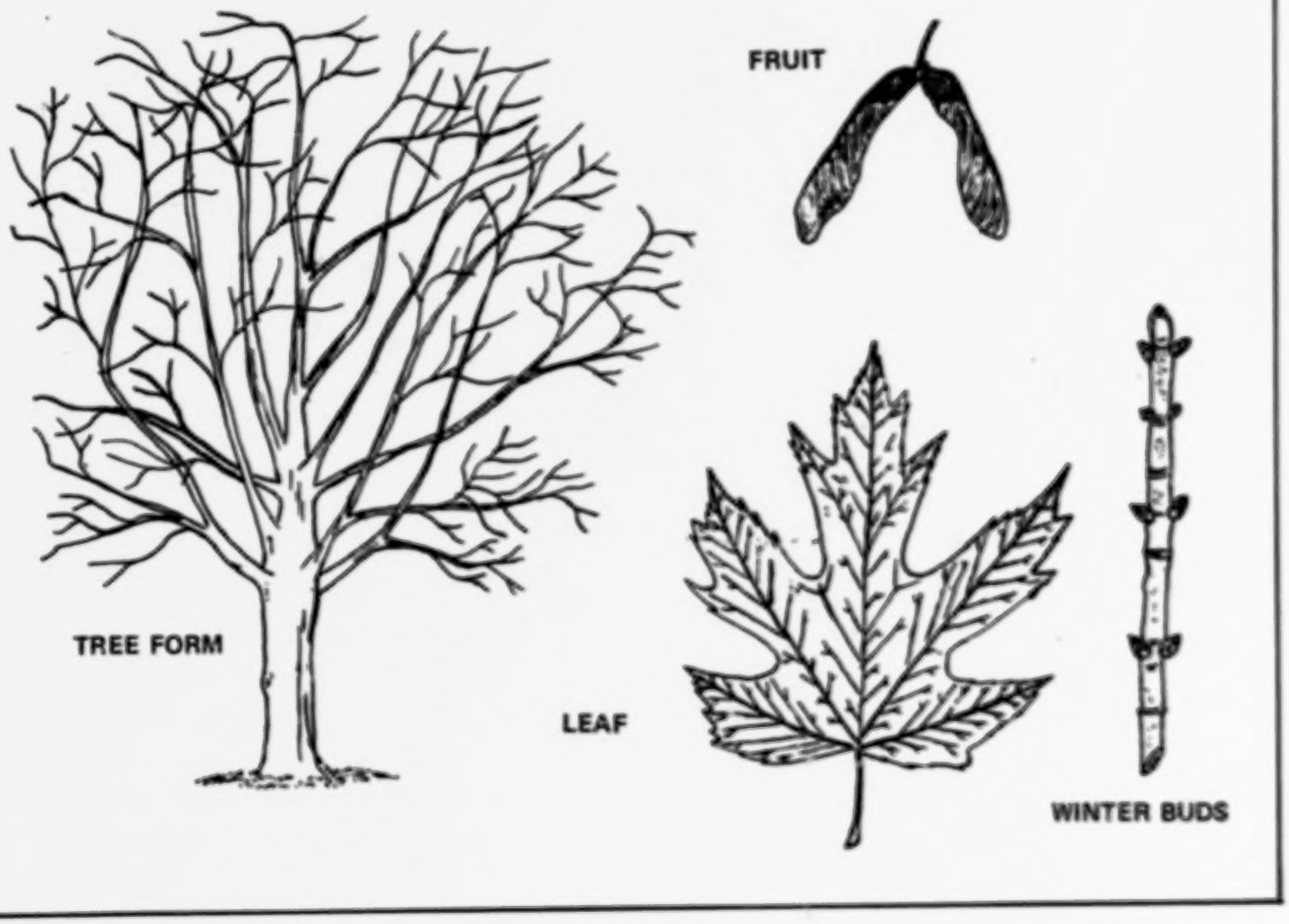


24. WEEPING WILLOW (Salix babylonica)

With its graceful, drooping branches, the weeping willow is a handsome tree that grows up to 35 feet tall. It is native to China and was brought to this country about 1730. Many people believe this is the tree mentioned in the Bible's Book of Psalms–hence the name *babylonica*.

The tree has alternate leaves, which are slender, finely toothed, and usually three to six inches long. They come out early in the spring and remain green late into the autumn.

The flowers are slender catkins that appear with the leaves in the spring. It is necessary to look carefully to find them and the seeds that develop from them.



25. SILVER MAPLE (Acer saccharinum)

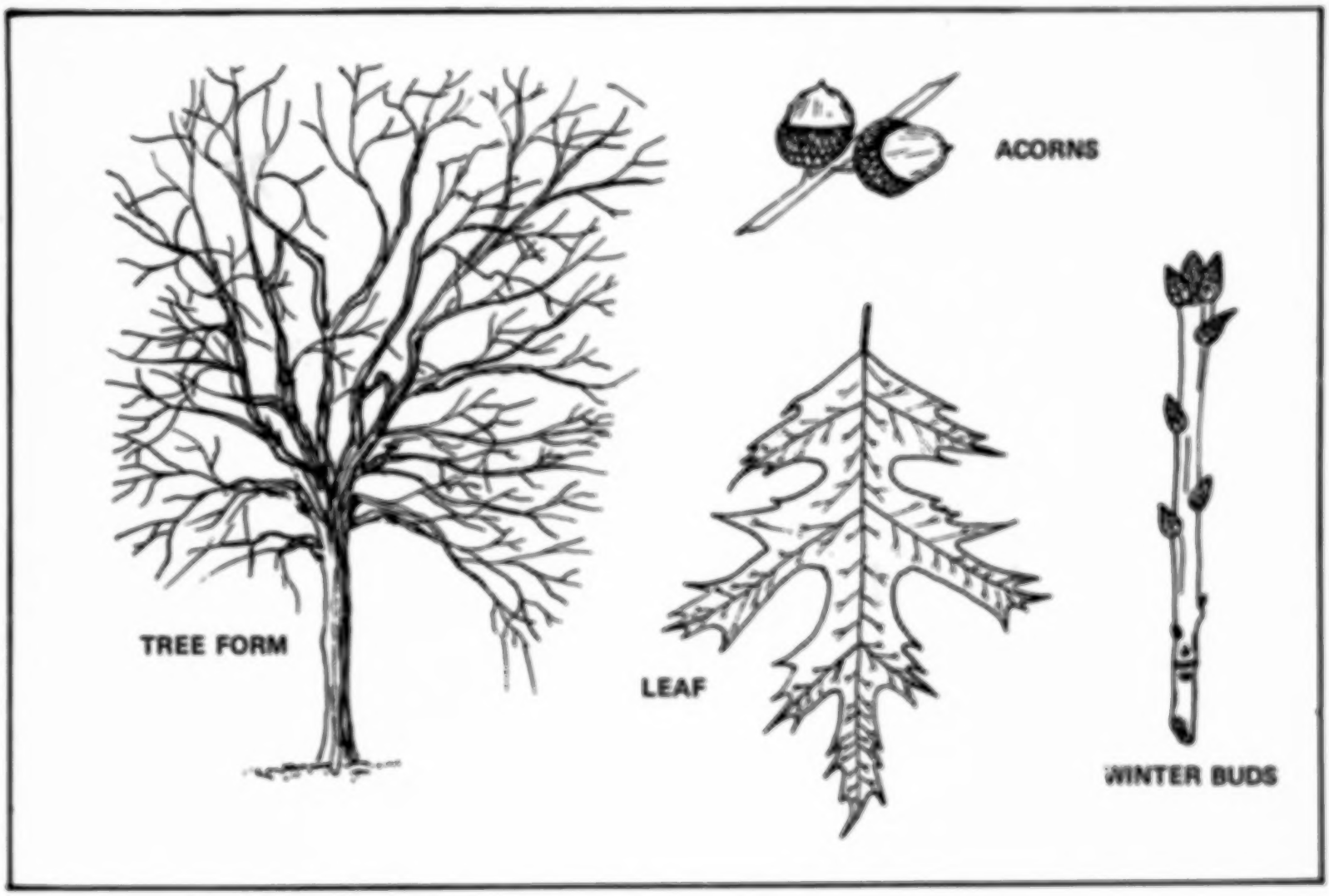
The silver maple is one of our native trees. It grows in a wide area from Quebec to Florida and is found as far west as Oklahoma. It has tall spreading branches which droop at the ends. Sometimes the tree reaches a height of more than 100 feet.

The leaves are opposite, bright green above and silvery white on the underside. They turn yellow in autumn. If you take a good look at the leaves you will know why another name for this tree is the cut-leaf maple.

The greenish flowers open at the beginning of spring and the fruits mature in May or June. The samaras (winged seeds) may be as large as 2 1/2 inches.

The bark of a young silver maple is smooth and gray; the bark of older trees becomes reddish brown and develops rough scales. The wood is strong and brittle. It is sometimes used for building and makes excellent charcoal. The winter twigs are chestnut brown.

Years ago the silver maple was planted on many of our streets because it grows rapidly. But brittle branches, broken during storms, caused so much damage that the tree is no longer used in curbside planting.



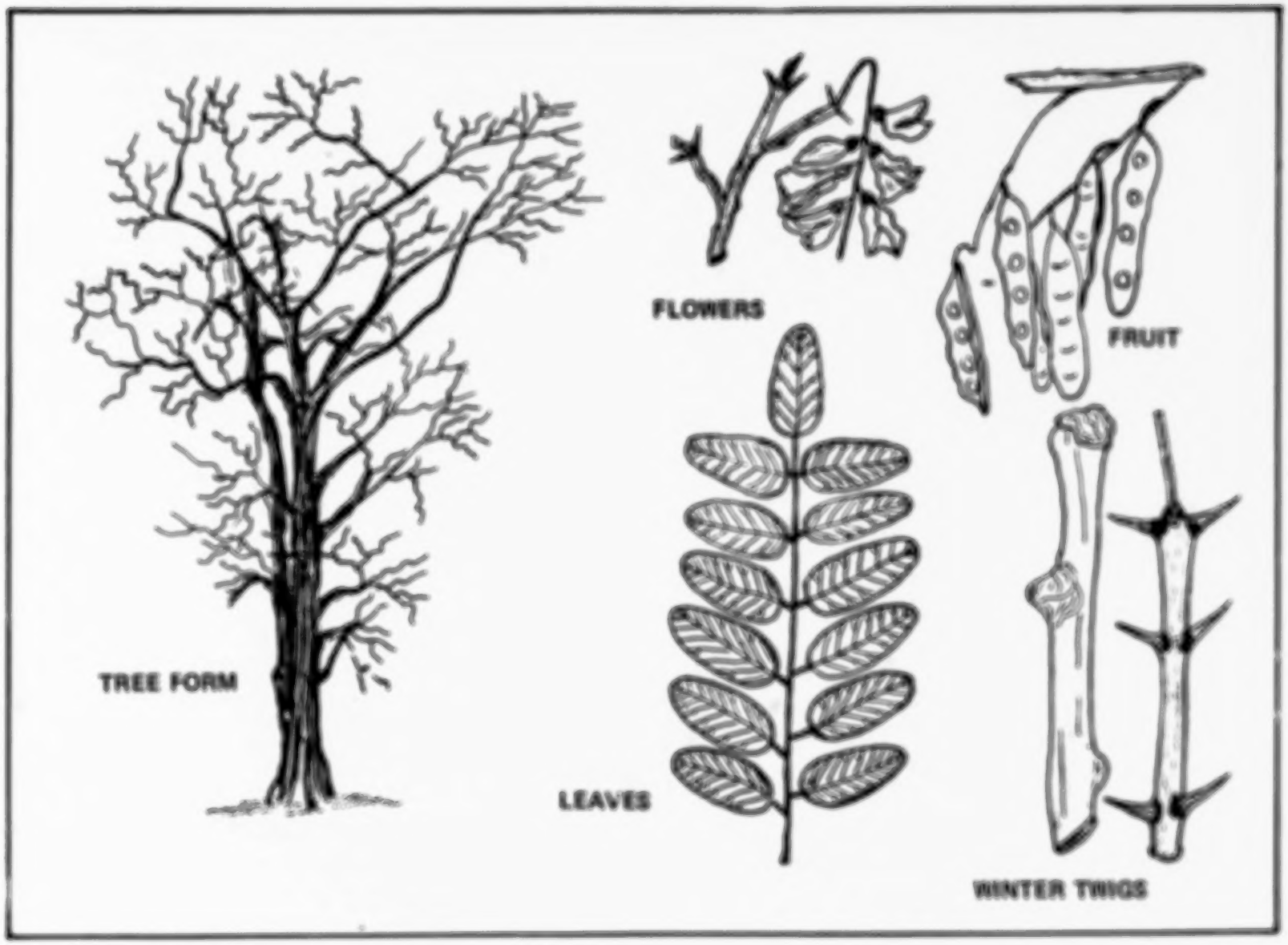
26. SCARLET OAK (Quercus coccinea)

The scarlet oak, a tree native to the area extending from Maine to Florida and west to Missouri, has been cultivated since 1691. It grows rather fast and may reach a height of 75 feet. At the top it has a narrowed, open crown.

The bright green leaves are somewhat like those of the pin oak, but they are broader across the middle and turn a brilliant scarlet in the autumn.

The showy staminate flowers and the small pistillate flowers open as the leaves come out in the spring. The acorns have shiny brown cups which encase half of the bitter, half-inch nuts.

Young scarlet oaks have green-brown, smooth bark, but the old trees develop brown-black bark, with uneven, scaly ridges. The branches lack the pins of the pin oak. The scarlet oak belongs to the black oak group.



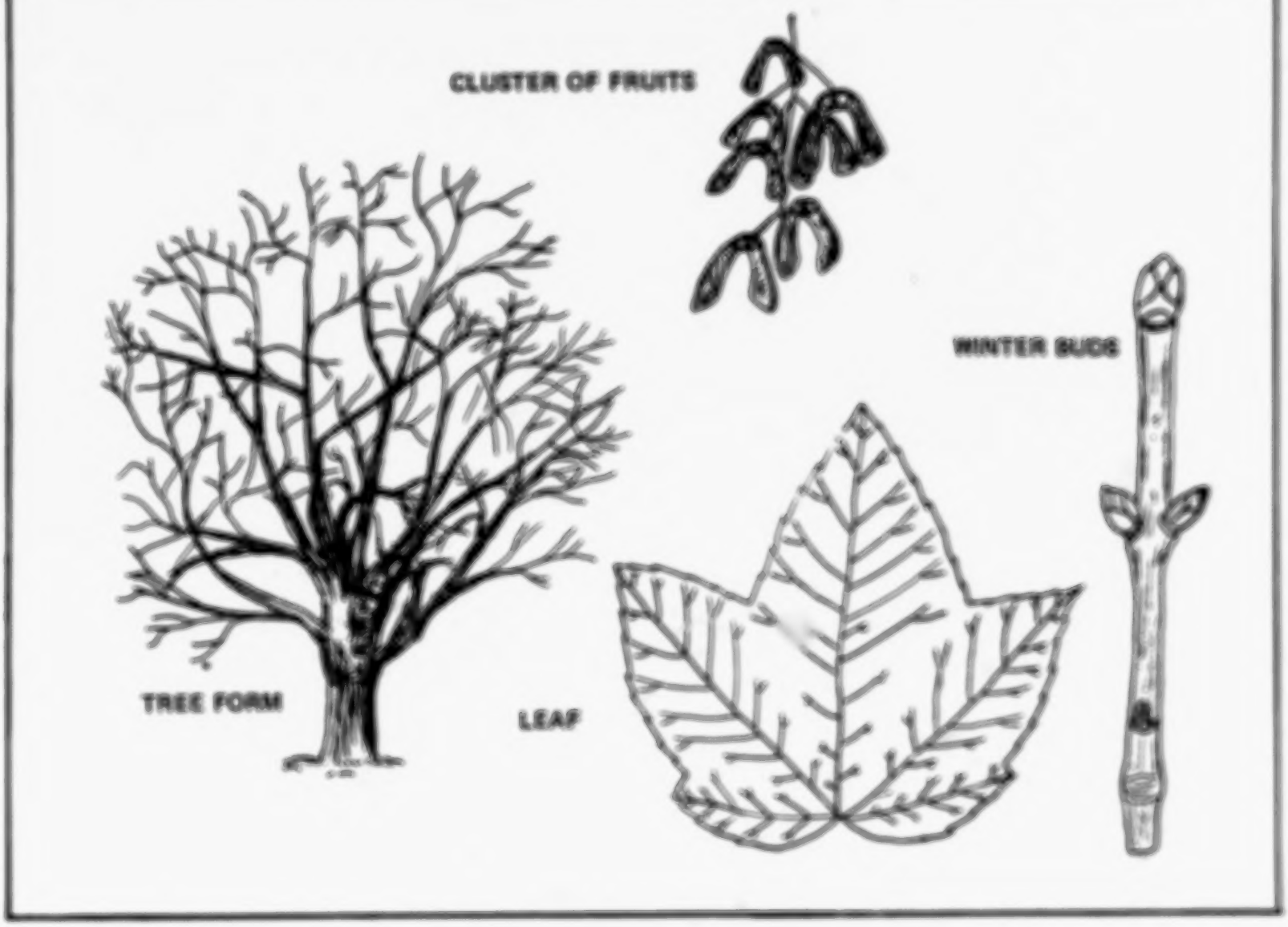
27. BLACK LOCUST (Robinia pseudoacacia)

The black locust tree originally grew at the edge of forests from Pennsylvania to Georgia, and west to Oklahoma. It has been planted in many places since 1635 and has spread over the eastern half of North America. It was introduced into France in the 17th century and is now naturalized over much of Europe. A healthy tree may grow as tall as 75 feet.

The fragrant blooms hang in graceful, drooping clusters. During June they fall off and carpet the ground like soft, white snow. Each flower is a reminder of the sweet pea, and indeed, the black locust tree belongs to the same family as the sweet pea. The seeds develop in beanlike pods that may hang on the tree all winter. The alternate, compound leaves grow from 7 to 14 inches long, with 7 to 19 small oval leaflets on each leaf. In early autumn they turn yellow and fall from the tree.

The wood of this tree is so strong that it is used for fence posts, tool handles, and poles. The bark is easily recognized by its deep furrows and orange-brown color. There are sharp little thorns on its branches.

Although the black locust is subject to attacks by the locust borer, this beautiful tree is often planted for its fragrance and its feathery foliage.



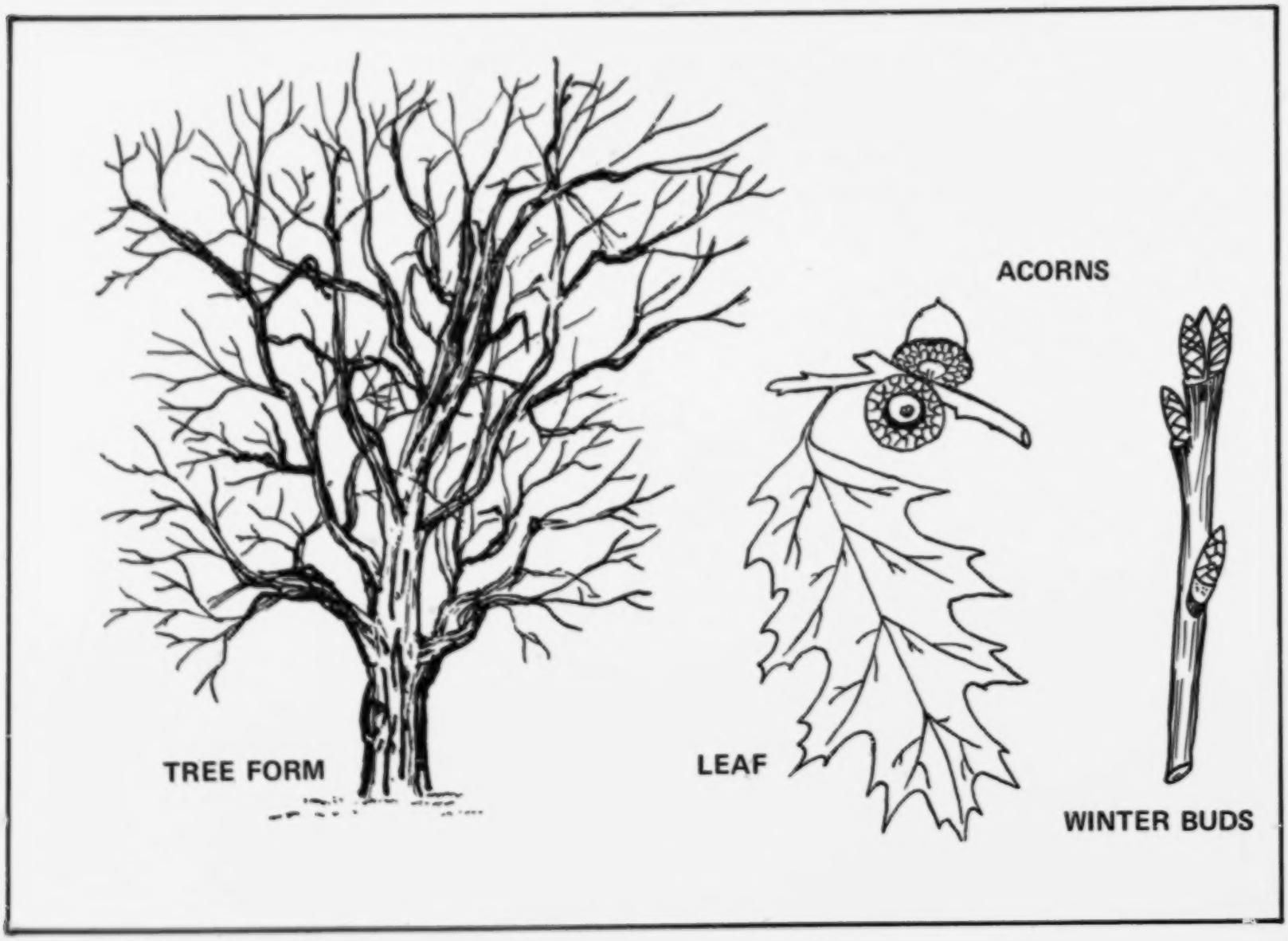
28. SYCAMORE MAPLE (*Acer pseudoplatanus*)

The sycamore maple is a large tree with spreading branches. Under favorable conditions it may reach a height of 70 feet. Like the Norway maple, it came to us from Europe an' Western Asia. Its opposite leaves are dark green above and pale underneath, thick and firm in texture, and they have a wrinkled appearance. Like the leaves of the sycamore tree, these leaves have three points—hence the name sycamore maple. Unlike the sycamore, however, the base of these leaves is heart-shaped.

In May its greenish-yellow flowers hang down among the leaves. This makes them difficult to notice unless you look closely. The seeds mature in August and September, and sometimes the clusters of two-winged fruits (typical maple samaras) hang on their long stems all winter.

The bark is brownish gray and breaks into thin scales. During the winter, the stout, smooth twigs are a shiny green or brown.

This is an important timber tree in its native home, but here it is grown for shade and beauty. Unfortunately, disease and insect damage prevent the sycamore maple from having a long life in the United States.

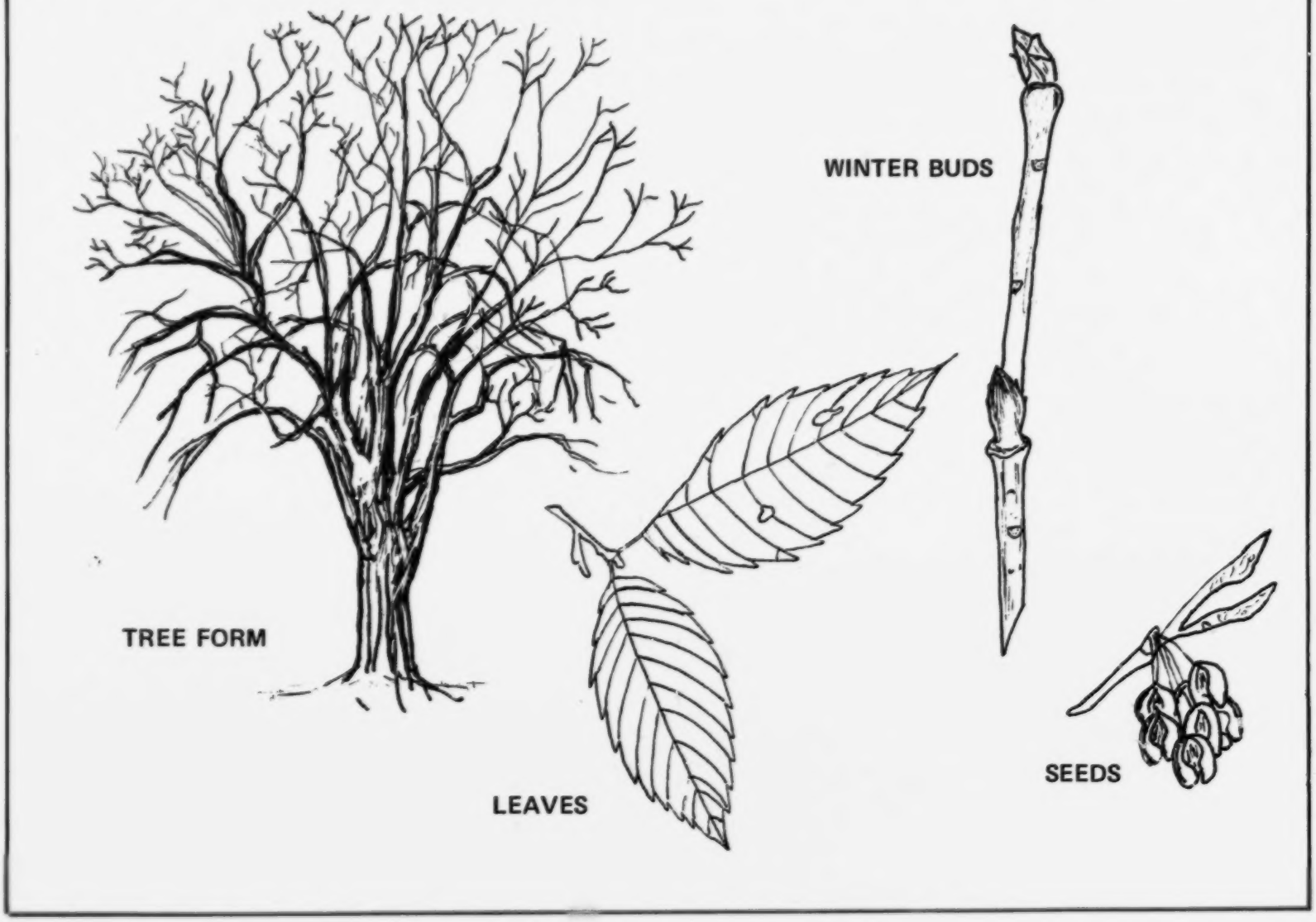


29. NORTHERN RED OAK (Quercus rubra)

Among the trees of Ward's Island, one of the handsomest is the northern red oak. It is native to the area from Nova Scotia to Minnesota and grows as far south as Alabama. A healthy tree can reach 75 feet in height, and its branches spread almost that wide.

The leaves are alternate, broader than those of the pin oak, and rounder at the base. In the fall they turn deep red, but by winter they are brown. Like most oaks, the red oak keeps some of its leaves far into the winter. In May, as the new leaves unfold, the long tassels of staminate flowers beautify the tree. The clouds of pollen they shed are carried by the wind to the small green, pistillate flowers. It takes two years for the large acorns, which are almost an inch in diameter, to develop in their shallow cups. This characteristic, plus its bristle-tipped leaf lobes, place the tree in the black oak group.

The bark is reddish brown to dark gray, with flat ridges. The wood of this oak is reddish brown and very strong. It is used to build railroad ties and houses. This native American tree has been cultivated since 1724, and large numbers of them have been shipped to Europe, where many have been planted in the parks of England and Germany.



30. AMERICAN ELM (Ulmus americana)

The American elm is a stately tree. Its branches fan out at the top, giving it a vaselike shape. Since early Colonial days, people have planted this tree on village greens and beside their houses. But now it is rarely planted because the Dutch elm disease, accidentally introduced from Europe, has taken the lives of many of these trees. In some areas, dead or dying elms are a common sight.

The species is found from Newfoundland to Florida and grows as far west as Texas where it thrives on river banks. In rich, deep loam it may reach a height of 140 feet, but it can grow in almost any soil.

The tiny, inconspicuous flowers bloom very early in the spring. The seeds are found in wafer-thin, papery wings, about a half-inch in diameter, which ripen as the leaves open. These seeds are blown by the wind, and a number of them may be found in the corners of the steps or along the fences of the trail.

The bark is dark gray and very rough. The leaves are alternate and always lopsided with prominent, straight veins. The edges are double-toothed, and the surface is rough. The wood is hard and tough and is used in wheel hubs, flooring, crates, and shipbuilding.

The decimation of this tree is a double loss because of its useful timber and great beauty. It is hoped that some means will be discovered to control the disease or that a type of elm immune to the disease will be found.

HELPFUL INFORMATION ABOUT TREES ON WARD'S ISLAND

TREES WITH BRIGHT AUTUMN LEAVES

Leaves turning red:
- Hawthorn
- Northern Red Oak
- Scarlet Oak
- Sweet Gum

Leaves turning yellow:
- Ailanthus
- Black Locust
- Eastern Cottonwood
- Gingko
- Horse Chestnut
- Norway Maple
- Silver Maple
- Sycamore
- Tulip Tree
- White Ash
- Willows

Leaves turning purple:
- Northern Red Oak
- White Ash

TREES WITH VERY LARGE LEAVES

- Ailanthus
- Catalpa

TREES WITH NARROW LEAVES

- Black Locust
- Willows

TREES WITH FRAGRANT FLOWERS

- Black Locust
- Hawthorn
- Linden
- Wild Black Cherry

TREES WITH SHOWY WHITE FLOWERS

- Black Locust
- Catalpa
- Hawthorn
- Horse Chestnut
- Linden

TREES WITH SHOWY YELLOW FLOWERS

- China Tree
- Birches (some)
- Willows (some)
- Tulip Tree

TREE WITH SHOWY RED FRUITS

- Hawthorn

TREES WITH NARROW PYRAMIDAL FORM

- Austrian Pine
- Gingko
- Japanese Black Pine

TREES WITH DROOPING BRANCHES

- American Elm
- Linden
- Pin Oak
- Silver Maple
- White Ash
- Wild Black Cherry
- Willows

TREES PREFERRING WET SOIL

- Eastern Cottonwood
- Linden
- Pin Oak
- Silver Maple
- Swamp White Oak
- Sweet Gum
- Sycamore
- Wild Black Cherry
- Willows

TREES FOR CITIES

- Ailanthus
- American Elm
- Austrian Pine
- Eastern Cottonwood
- Gingko
- Horse Chestnut
- Linden
- London Plane
- Maples

HOW TALL SOME TREES CAN GROW

Sycamore	160 feet
Northern Red Oak	150 feet
Tulip Tree	150 feet

AGE AT WHICH TREES MATURE

Linden	100 years
Elms	90 years
White Ash	80 years
Birches	50 years
Eastern Cottonwood	50 years
Willows	50 years
Catalpa	25 years

RATE OF GROWTH FOR TREES

After 20 years of favorable conditions, a three-inch sapling will have the following diameter:

Silver Maple	21 inches
American Elm	19 inches
Sycamore	18 inches
Tulip Tree	18 inches
Linden	17 inches
Ailanthus	16 inches
Catalpa	16 inches
Horse Chestnut	13 inches
Northern Red Oak	13 inches
Pin Oak	13 inches
Scarlet Oak	13 inches
White Ash	12 inches